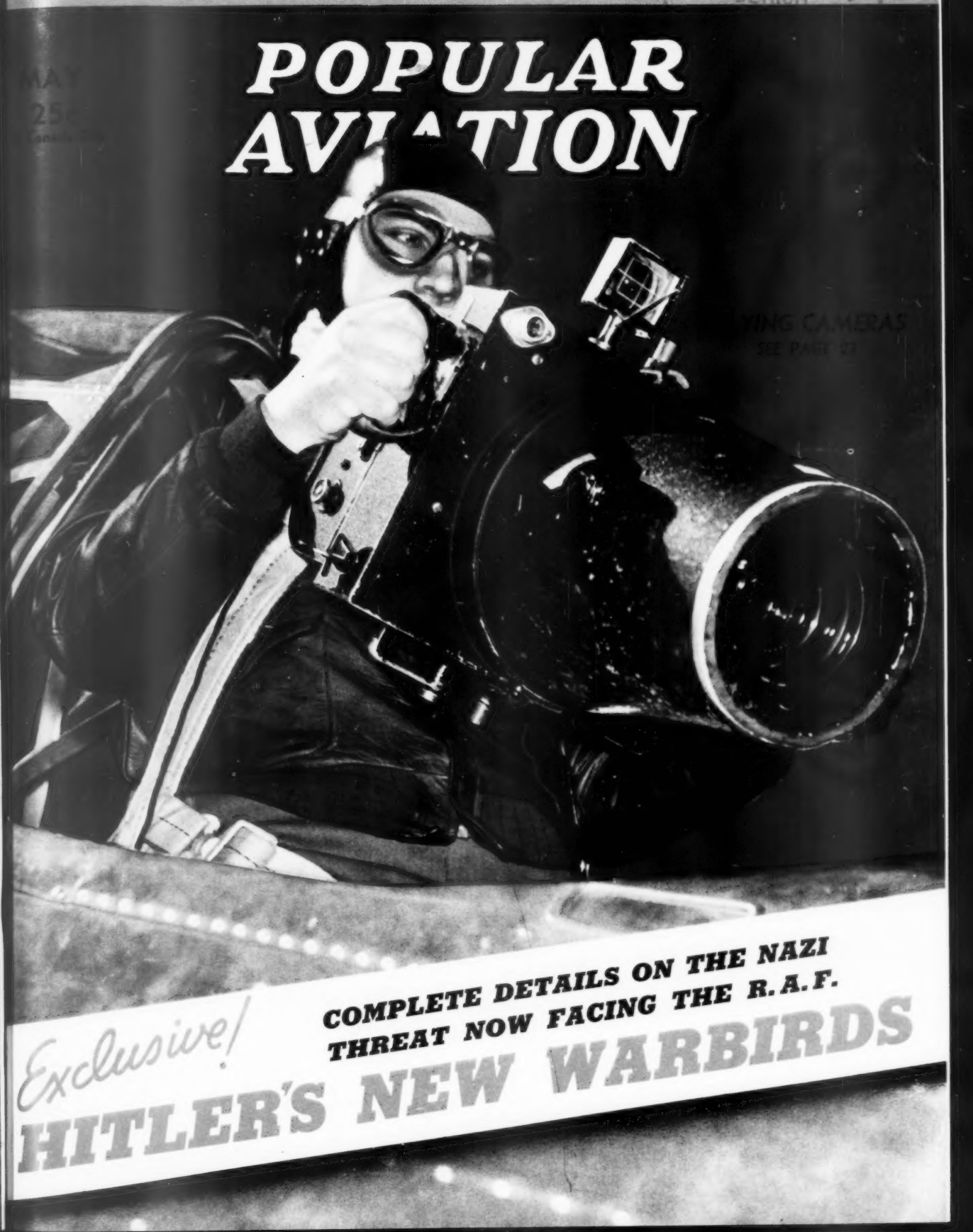
PUBLIC LIBRARY
APR 7 1941
DETROIT

FLYING AND POPULAR AVIATION



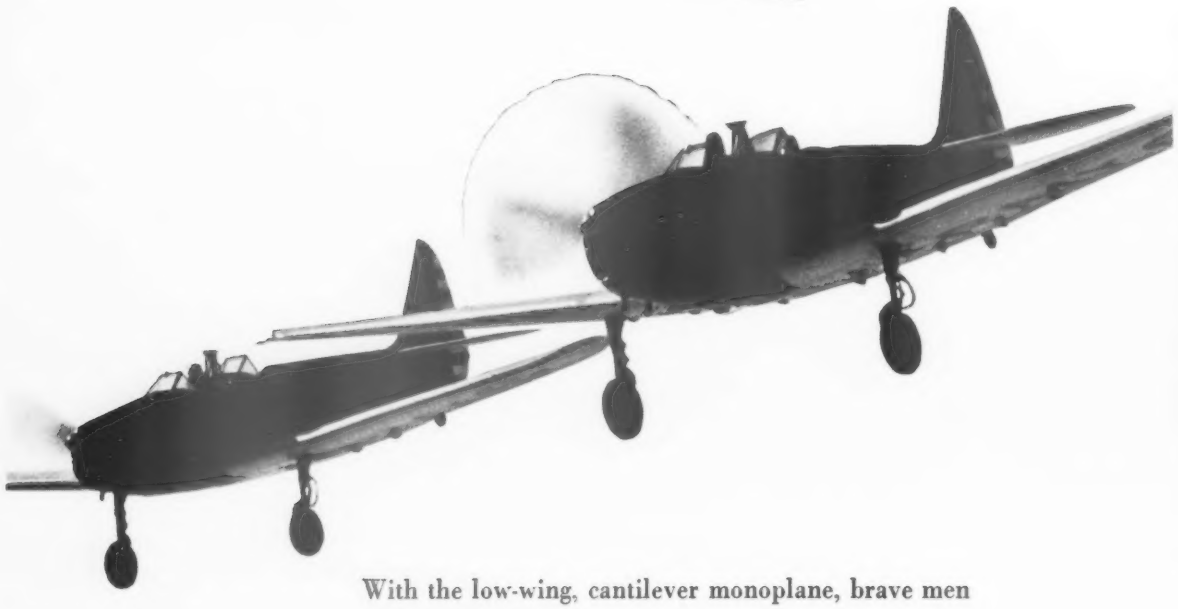
FLYING CAMERAS
SEE PAGE 51

Exclusive!

COMPLETE DETAILS ON THE NAZI THREAT NOW FACING THE R.A.F.

HITLER'S NEW WARBIRDS

MODERN FIGHTING PILOTS

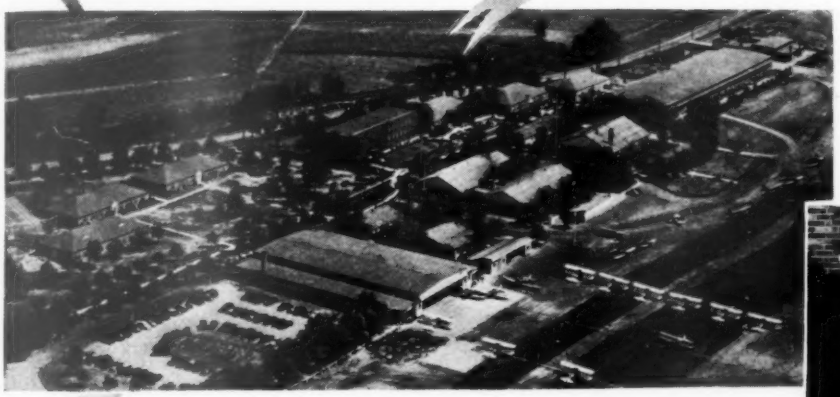


With the low-wing, cantilever monoplane, brave men write today's history — and tomorrow's — in the air. So that thousands of young Americans may feel this instrument of national destiny familiar in their hands, Fairchild is producing by hundreds such a training plane. The Fairchild M-62, in the hands of Army and civilian schools, is training *modern fighting pilots* — from the ground up.

FAIRCHILD AIRCRAFT

Division of Fairchild Engine & Airplane Corporation
Hagerstown, Maryland . . . Cable Address "Faircraft"

When You Choose Your Aviation School Select the One That TRAINS FOR LEADERSHIP in Commercial Aviation



At Left — *Aerial view of Parks Air College.*
Below — *"This is to tell you how pleased we are with the uniformily high results of the tests of your engineering group. It was about the best group we have ever tested." So wrote the Personnel Director of an aircraft factory, which maintains a staff of over 600 engineers, after giving tests to 14 of this group of 1940 Fall term Parks Aeronautical Engineering graduates.*
At Bottom — *Parks Air College teaches you the* WHY *as well as the* HOW.

You take a long step towards assuring your future success when you select the school that prepares you for a career, not just a job, in commercial aviation.

Therefore, you should acquaint yourself thoroughly with the advantages offered by Parks Air College—the school that has enjoyed Department of Commerce approval longer than any other in the United States.

Adhering to full college standards, Parks offers you thorough training in necessary technical skills. But that is not all. In addition, Parks gives you a comprehensive grounding in *basic principles* in your particular field of aviation.

At Parks you develop your capacity for independent, original thinking, a prime requisite for advancement. You learn to think problems through to the solution. You become familiar with the WHY as well as the HOW. You prepare for a career, not just a job.

With such a background, specialized in your field, yet broadly comprehensive, you can rise to leadership; you can win the increased recognition and remuneration that are the result of advancement to positions of large responsibility in the industry.

Determine *now* to select training that will equip you for steady progress. The records of hundreds of Parks graduates in commercial aviation, who today are in positions of leadership, are proof of the value to you of Parks standards and methods of education.

If your mind is set on success, you must match the quality of your training to your life plan. You're invited to send for complete information on the training opportunities offered by Parks Air College. The 64-page catalog, including full details, will be sent upon request.

PARKS AIR COLLEGE East St. Louis, Illinois

PARKS AIR COLLEGE was founded August 1, 1927.
Has enjoyed Federal approval longer than any other aviation school.
Is accredited in its Aeronautical Engineering School by the Illinois Superintendent of Public Instruction.
Is accredited by the United States Office of Education of the Federal Security Agency.
Graduates are qualified educationally for appointment as flying cadets in the U. S. Army Air Corps and for flight training in the U. S. Naval Air Reserve.
Has a capacity enrollment of 300 commercial aviation students, 216 U. S. Army Air Corps flying cadets and 48 enlisted mechanics.
Has its own airport with a school plant of 25 buildings devoted to school purposes entirely, also two fields of 568 acres and 96 acres for military flight training.
Has a faculty of 82, each especially qualified for his particular field of instruction.

PARKS AIR COLLEGE Section PA-5
East St. Louis, Illinois

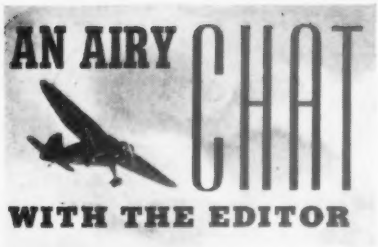
Please send me details of four major courses in commercial aviation training.

Name..... Age.....

Address.....

City.....

State.....



YOU have heard much talk lately about this country's "slow production" of military aircraft. The talk has come largely from Senators and Congressmen in Washington and has inevitably made its way around the country in the newspapers. Hence, the average American has heard time and again that our aviation industry is dangerously slow and unprepared.

In the first place, such statements are largely distortion and misrepresentation. In the second place, many of the men issuing those statements are directly responsible for the fact that production of American warplanes is not—and could not possibly be—five times what it is today. Those same Washington politicos have continually pooh-poohed the constant pleas of Army and Navy aviation men to build up our air forces at least to a par with other world powers. Throughout those plush pre-war years the same Congressmen and Senators knifed every effort of far-sighted Army and Navy officers to build up our aerial defenses.

Then came Hitler. German warplanes shattered and smashed whole nations. There was—and is—only one thing that will stop the *Luftwaffe:* powerful aerial resistance. France realized it, but too late. The British woke up to the fact in the nick of time. Now we are in the same boat.

For anyone to say that our aviation industry is slow and antiquated is a deliberate misstatement of fact. The only reason we don't have thousands of first-line warplanes is because a majority of easy-going Senators and Congressmen refused to appropriate the funds that were sought so urgently by our Army and Navy. And now that the Germans have shown us what overwhelming air power can do, those same politicians—who have been forced to appropriate millions more than would have been necessary—are criticizing the Army, Navy and the aviation industry for being slow. Under the circumstances, the American aviation industry is working a modern miracle—and is speeding up by the hour. Remember: the modern warplane is a tremendously complicated machine held together by hundreds of thousands of rivets, every one of them put in by hand. Yet, despite the fact that it takes an average of 14 months from blueprint to a new flying warplane, this country's aviation industry already is approaching 1,000-planes-per-month production. Compared to the automobile industry's highly mechanized production systems, this accomplishment is truly breathtaking.

(*Continued on page* 113)

FLYING
AND POPULAR AVIATION

Volume XXVIII Number 5

Contents

MAY, 1941

Hitler's New Warbirds	Leonard Engel	14
Super-Service Specialists	Hill Edwards	16
Transatlantic Bridge	DeWitt Wendell	18
Ferry Hop	Ensign Marsh Miller	20
Flying Cameras	Alfred Toombs	23
'Speedy'	C. A. Bell	25
Five Men and a Plane	Edward Churchill	26
Test Tube Aces	James Montagnes	28
'Lightning'		31
The Army Wants Them Smart	Major Roland Birnn	32
Planes for Small-Town Papers	George R. Reiss	35
Pilots Coming Up!	Virginia Withington	37
I Learned About Flying from That!—No. 25	Herbert L. White	39
Engine Lab	Walter Orr	40
Airplanes—Stay Away!	William D. Strohmeier	42
Bottleneck in Brains	Bruce Campbell	44
How to Run an Airport	Kurt Rand	46
Night Solo	Lieut. Frank R. Pancake	48
Quick Shift	Ralph F. Kreiser	50
Want a Job?	Hurd Barrett	51
AOPA News		53
You Don't Say!		53
Data Book		55
Controllable Propellers	Raoul J. Hoffman	57
Have You Seen?		58

Cover Photograph by Cy La Tour

Copyright, 1941

ZIFF-DAVIS PUBLISHING COMPANY
Editorial Offices: 608 S. Dearborn St., Chicago, Ill.
Member of the Audit Bureau of Circulations

FLYING AND POPULAR AVIATION is published monthly by the Ziff-Davis Publishing Company at 608 S. Dearborn St., Chicago, Ill. William B. Ziff, Publisher; B. G. Davis, Editor; Max Karant, M.I.Ae.S., Managing Editor; J. Fred Henry, Business Manager; Herman R. Bollin, Art Director. New York Advertising Office, 381 Fourth Ave. West Coast Advertising Representative, Jess Laughlin, 416 W. Eighth St., Los Angeles, Cal. SUBSCRIPTION RATES: In U. S., $2.50 per year, single copies 25 cents; in Canada, $3.00 per year, single copies 30 cents. Other foreign subscriptions $3.50 per year. Subscribers should allow two weeks for change of address. Address all subscription letters to the Director of Circulation, 608 S. Dearborn St., Chicago. Entered as second class matter, July 16, 1940, at the Post Office, Chicago, Illinois, under the act of March 3, 1879. Contributors should retain copy of contributions. All submitted material must contain return postage. Contributions will be handled with reasonable care, but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever adaptations and revisions are necessary to meet requirements. Payment will be made at our current rates upon acceptance and, unless otherwise specified by the contributor. all photographs and drawings will be considered as part of the manuscript in making payment.

Train AT AVIATION'S SCHOOL OF THE HOUR!

THIS TOWER OVERLOOKS AVIATION'S MOST DISTINGUISHED SCHOOL OF AERONAUTICS

IN THE VERY CENTER AND A VERY IMPORTANT PART OF SOUTHERN CALIFORNIA'S GREAT AIRCRAFT INDUSTRY IS LOCATED CURTISS-WRIGHT TECHNICAL INSTITUTE.

Established in 1929, in twelve years this famous school has come to be recognized as the nation's leading institution in the training of Aeronautical Engineers and Master Mechanics. Mr. Donald Douglas, President of the great Douglas Aircraft Company, chose this school for his own son's training which pointedly indicates the high standing this school has attained in the aircraft industry.

You, who plan to invest in a course of career training to prepare yourself for the future, must determine in advance what the returns will be on your investment before you put cash on the line. This is imperative since your choice of a school in which to take your training will determine how much money you will make all the rest of your life. Your whole future in aviation depends on your training.

Curtiss-Wright Tec's career training is carefully designed to do just one thing:—TO MAKE MORE MONEY FOR YOU so upon graduation you can be independent and self-supporting for life. For years our hundreds of successful graduates have proven that Curtiss-Wright Tec training gets results and always pays. It has provided them with a profitable occupation and secure future since it trained them in advance for the highest position they could ever expect to occupy. It can do the same for you.

Aviation needs trained men. They are in demand and at a premium. Advancements for them are rapid, especially here in Southern California where there are over a billion dollars in unfilled aircraft orders on hand and where over fifty per cent of all aircraft manufactured in the United States is made. You can get in on the ground floor by training now, BUT you must choose the right school for your training.

Our graduates are obtaining immediate employment and the demand for them far exceeds the supply. We honestly believe that every student who enrolls here will be able to obtain, with our assistance, immediate employment upon graduation. This school has never guaranteed or promised positions for its graduates, but practically every graduate has obtained immediate employment, and is advancing steadily.

WARNING!—"don't miss the boat." The greatest opportunity of your lifetime exists today! There never was such an opportunity in aviation for you; there may never be another. A position awaits you. Insure for yourself a steady income and independence for life. Send in your enrollment today before you "miss the boat."

OFFERING SPECIALIZED AND PROVEN TRAINING IN

AERONAUTICAL ENGINEERING AND MASTER MECHANICS

No Flying Involved

CURTISS WRIGHT TECHNICAL INSTITUTE

GRAND CENTRAL AIR TERMINAL 1225 AIRWAY GLENDALE (LOS ANGELES) CALIF.

UNDER PERSONAL SUPERVISION OF MAJOR C. C. MOSELEY, OWNER, SINCE ITS ESTABLISHMENT IN 1929

Contractor to the U. S. Army Air Corps

BE WISE—PROTECT YOUR FUTURE

MAIL TODAY — WITHOUT COST OR OBLIGATION SEND ME FULL INFORMATION AND CATALOG ON THE COURSE CHECKED BELOW — DON'T DELAY

- ☐ AERONAUTICAL ENGINEERING COURSE
- ☐ MASTER AVIATION MECHANIC COURSE
- ☐ SPECIALIZED ENGINE COURSE
- ☐ SPECIALIZED AIRPLANE COURSE
- ☐ POST GRADUATE AERONAUTICAL ENGINEERING COURSE
- ☐ SPECIALIZED AIRCRAFT SHEET METAL COURSE
- ☐ AERONAUTICAL DRAFTING COURSE, HOME STUDY
- ☐ AIRCRAFT BLUE PRINT READING COURSE, HOME STUDY

NAME _____

ADDRESS _____

CITY _____ STATE _____

PA-5

the Birdmen's Perch

Editing this page, is one series of surprises after another. I'd just about given up on getting any more stories about boners while flying. And then all of a sudden the customers seem to lose their bashfulness and I get dozens of 'em! You'll find this month's choice printed below.

Major Al Williams, alias "Tattered Wing-Tips,"
Gulf Aviation Products, Gulf Building, Pittsburgh, Pa.

FUNNYBONER DEPT.

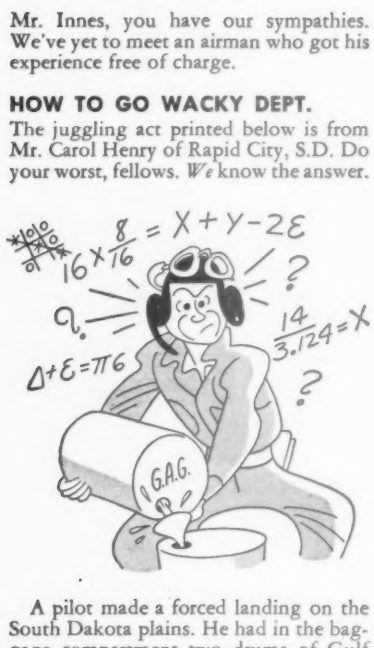
Last summer I had to make a rush trip to Salt Lake City. Upon approaching the field, the red light in the tower showed closed so I circled until the approaching air liner came in. By this time I was well away from the field and anxious to get down, so I peeked back over my shoulder to see if the clear lights would flash. But because of the position of the ship it was impossible to see, so did I turn the ship or slip it? I did not. I poked my old bald head out of the window and Zing! went a $22.00 pair of glasses. Why can't a person learn things more easily?

J. P. INNES,
Ogden, Utah.

Mr. Innes, you have our sympathies. We've yet to meet an airman who got his experience free of charge.

HOW TO GO WACKY DEPT.

The juggling act printed below is from Mr. Carol Henry of Rapid City, S.D. Do your worst, fellows. *We* know the answer.



A pilot made a forced landing on the South Dakota plains. He had in the baggage compartment two drums of Gulf Aviation Gasoline. The first drum was too heavy so he poured 12 gallons into the second drum. The first drum then contained 6/11 of the amount in the second drum. If he had poured 16 gallons back into the first drum, the second would have contained 7/10 of the amount in the first. How many gallons of G.A.G. did each drum contain?

IT DOESN'T LOOK UNUSUAL . . . BUT IT IS!

We received a mighty nice letter from one of our readers the other day, expressing his appreciation of the many things Gulf goes out of its way to do for airmen. We really appreciated his sentiments, but we'd like to remind you, and him, that one of the *finest* things Gulf does isn't quite so apparent.

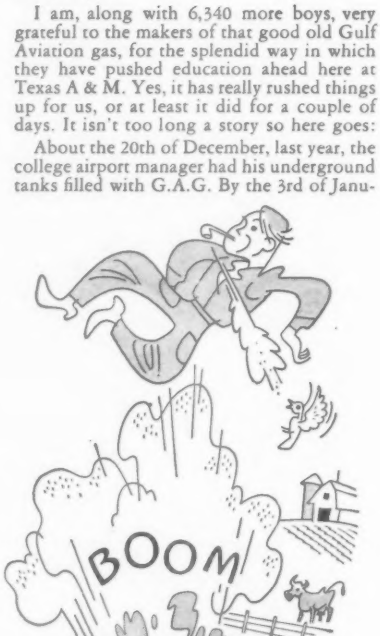
That's the extra trouble we go to in refining Gulfpride Oil. Besides regular refining processes, we put it through an extra process that removes up to 20% more of the carbon-and-sludge formers. This doesn't show up in the *looks* of the oil, but it does show up in the way it stays "up" in your motor and pares engine wear and repair bills.

THIS MONTH'S WHOPPER

Dear Major:

I am, along with 6,340 more boys, very grateful to the makers of that good old Gulf Aviation gas, for the splendid way in which they have pushed education ahead here at Texas A & M. Yes, it has really rushed things up for us, or at least it did for a couple of days. It isn't too long a story so here goes:

About the 20th of December, last year, the college airport manager had his underground tanks filled with G.A.G. By the 3rd of January, the tanks were empty and the dealer was called out to refill them. Unfortunately (or should I say "fortunately") the dealer was out of town and sent his helper. The boy had put in only three gallons when he decided he wanted to light his pipe, which he promptly did. Well, it's the same old story of the lighted match. It landed right in the middle of the gasoline! The tank, boy, and three gallons went sky high!



The surprised but unhurt lad landed close to Dallas in some farmer's silo; the tank was found near San Antonio; but the G.A.G. formed a cloud above the campus!

The next day the weather turned off bad and the ceiling became absolute zero. The cloud of G.A.G. settled upon the campus

like bees upon the comb. Night came. Everyone opened their windows to let in the wonderful fresh night air. By the next morning, everything and everyone was thoroughly saturated with a dilute solution of that powerful G.A.G.! BELIEVE IT OR NOT! WHAT LITTLE G.A.G. WE HAD BREATHED WAS POWERFUL ENOUGH TO GIVE US THE ENERGY AND SPEED TO FINISH A WHOLE MONTH'S SCHOOL WORK, TAKE THE FINAL EXAMS, AND REGISTER FOR THE NEXT SEMESTER, *ALL IN THE SPACE OF 48 HOURS!*

Thank goodness, you d.dn't make it a mite more powerful because an hour later the effect had worn off! Naturally, we had the rest of the semester off, thanks to Gulf's great contribution to the aviation world! This is why 6,340 Texas Aggies appreciate your famous product now, if they didn't before!

By the way, the boy is now SHINING SHOES FOR A LIVING!!

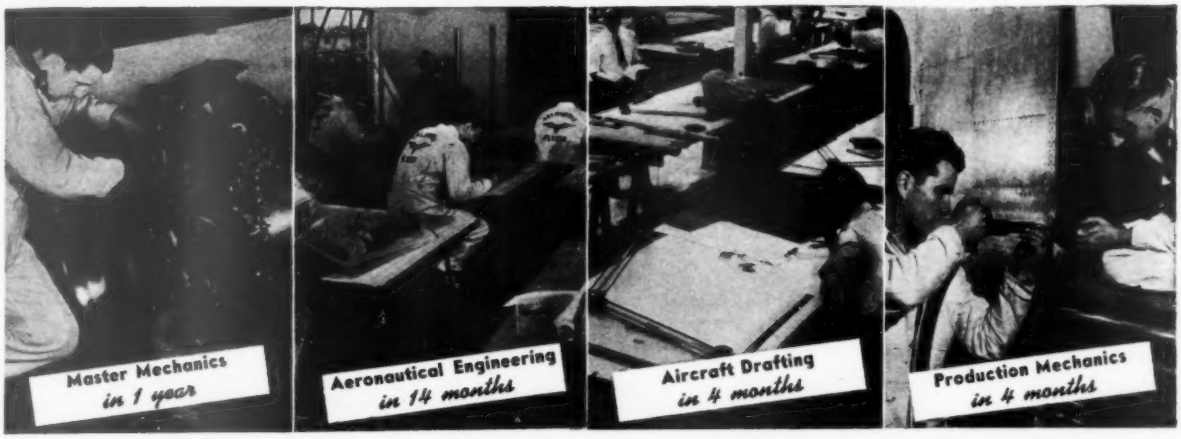
Sincerely yours,
JOHN M. HOLMAN
alias "Shattered Rudderbar"

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF **GULF AVIATION PRODUCTS**

THIS TRAINING *places* YOU IN AVIATION

(in 4 to 14 months)



WE CAN'T SUPPLY DEMAND FOR OUR GRADUATES

"I am a California Flyers Graduate." It means something to say that. It means that aviation wants you to the extent that over 96% of all California Flyers graduates are employed in the industry and that it is impossible to supply the demand for our graduates. It is a passport into aviation. Secondly, it means that you are a man marked to succeed like the California Flyers graduates before you. And that is what *really* counts.

Why does a California Flyers man stand so high? It is obvious once you have heard the complete story of this famous school. Its founders believe that aviation should be taught in a school where the student remained an individual—learning aviation as it pertains to his individual ambitions and qualifications, and by so doing preparing *him* for the responsibilities of leadership. This way the graduate is prepared to meet today's aviation problems and to contribute to tomorrow's aviation advancement. This is the way today's leaders learned. Only this way can a training program be built for the industry, on industry's specifications. They believe too, that the entire field of aeronautics:—engineering, mechanics and piloting are all closely interwoven and that a student should train in a school that teaches all of these important divisions. Above all, they believe that aviation should be taught in an environment of aviation activity, taught where the greatest aviation developments originate, taught where there is the greatest number of men actively engaged in aviation. This is why California Flyers is located in the heart of the world's aviation capital on the world's busiest testing field.

If this is the kind of school that you would like . . . friendly, efficient, modern and thorough; an aeronautical school operated by practical aviation men, you will be most interested in reading the *complete* story of California Flyers in the new 64 page catalog which tells today's story of aviation at work, complete details of the training courses and just what it takes to be a *California Flyers man.*

Contractors to the United States Army Air Corps . . . Approved by the C. A. A. of the United States Government for Flight, Ground and Master Mechanics Courses

• Write for new 64 page catalog, get complete information on all of California Flyers' aviation training courses, tuition and employment opportunities.

CALIFORNIA FLYERS, INC.

SCHOOL OF AERONAUTICS

LOS ANGELES MUNICIPAL AIRPORT, INGLEWOOD, CALIFORNIA

LEARN ABOUT THIS COMPLETE RANGE OF PRACTICAL CAREER COURSES

CALIFORNIA FLYERS, INC., School of Aeronautics, Los Angeles Airport, Inglewood, Calif., Dept. PA-5.

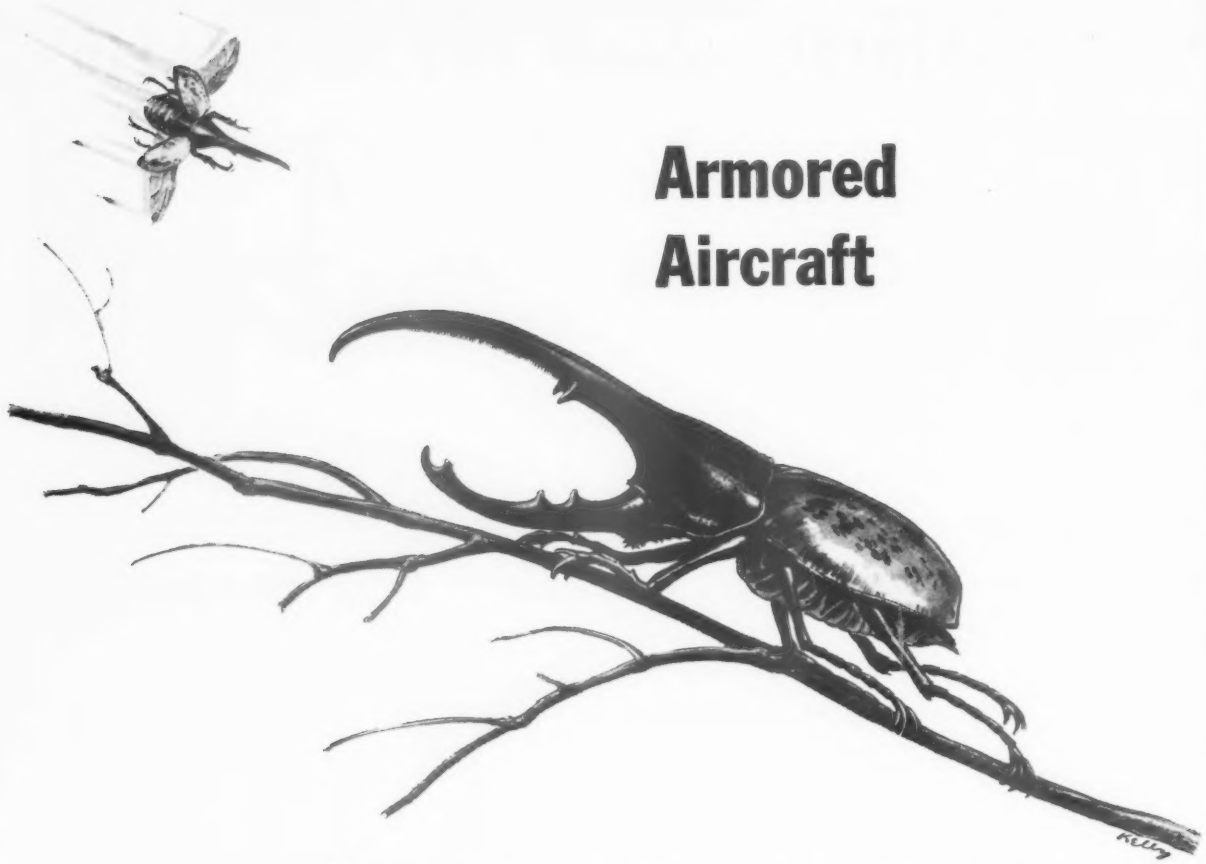
Please send me your Catalog and Vocational Guide with complete information on training, tuition, living conditions and employment opportunities. I am over 16 and interested in the subjects, checked:

Aeronautical Engineering ☐ *Airline Piloting* ☐
Production Mechanics (Aircraft sheet metal) ☐ *Aircraft Drafting* ☐
Instrument and Radio Beam Flying ☐ *Master Mechanics* ☐
Instrument Technician ☐

Name_____ Age_____

Address_____

City_____ State_____



Armored Aircraft

Many of the armored bugs such as the Hercules Beetle shown here have solved a problem that at present is engaging the attentions of some of the world's leading aviation engineers. That is the protection of the vital parts of aircraft with armor plate without sacrificing too much flying ability.

There are two approaches to the problem. One is essentially in the province of the metallurgist—the development of lighter, stronger armor steels. The other falls to the aviation engineer—the designing of planes to carry successfully the extra weight armor necessarily imposes. Since more weight automatically calls for more *power*, Ethyl engineers, by working closely with aviation engineers in a program of practical research, are privileged to contribute toward our national defense.

Every pound, every ounce shaved from the weight of future engines can be put into life-saving armor. At the same time, the data gained from this cooperative research are largely fundamental in nature. While certain immediate applications may be of military nature, the greatest ultimate value will be to commercial aviation. The information that is being developed will be of inestimable value to the aviation technologists who seek to safeguard American air supremacy—whether military or commercial.

ETHYL GASOLINE CORPORATION, ***manufacturer of anti-knock fluids used by oil companies to improve gasoline***

A Second Generation HELPS CARRY ON THE AERONCA TRADITION OF QUALITY

Above: "O.K., Roy," says J. Frank Sparks, machinist, to his son who has just completed machining an Aeronca precision landing gear part.

EFFICIENT assembly lines and high quality materials, alone, will never build a fine airplane . . . it takes skilled craftsmanship, too. That's why we, at Aeronca, are so fortunate in having many father-and-son combinations working side-by-side in the Aeronca plant. It is our assurance — — and yours, too — that Aeronca quality and Aeronca performance shall be maintained for many years to come.

If you haven't yet enjoyed the luxury of a flight in the new 1941 Aeronca Super Chief, plan now to have your nearest Aeronca dealer give you a free demonstration. Once you've seen how easily the Chief handles, and learn how easy it is to own, you'll never be satisfied until you fly your own Aeronca. See your Aeronca dealer today.

Left: "Aeronca quality demands absolute accuracy," Mr. Harry Graf tells young Arthur.

Right: "Like Father, like Son." Chester Tomilson, welding foreman, demonstrates the fine points of welding to his son, Chester, Jr.

ONLY AERONCA HAS ALL THESE FEATURES:

- New streamlined beauty . . .
- New two-toned custom interior . . .
- New larger and more comfortable cabin . . .
- New soundproofing insulation for greater quiet . . .
- New unobstructed visibility . . .
- New roomy luggage compartment...
- New cabin temperature control . . .
- New centralized control panel . . .
- New easy-opening safety cowl that lifts up like a motor car's hood. . .
- New longer cruising range . . .
- New higher cruising speed.

AERONCA GIVES WINGS TO THE WORLD

AERONCA AIRCRAFT CORPORATION

E-5 MUNICIPAL AIRPORT, Middletown, Ohio. Cable Address: Aeronca, U. S. A.

Exclusive Export Agents: AVIATION EQUIPMENT AND EXPORT, INC., 25 Beaver Street, New York City

"TOMORROW'S OPPORTUNITIES" IN AVIATION ARE HERE TODAY

Don't Delay— Start Your Career *Now* and Move Up Fast

You can still count on Aviation getting bigger and bigger. But what is most important to you right now is that Aviation is a BIG industry this very minute... with the size and developments that no one expected for years. The jobs are here by the thousands, and that means you don't have to worry about making your start in Aviation if you are properly trained. You can move up faster because the industry is bigger and moving faster itself. Opportunities to make valuable personal contributions in your chosen line of work are limited only by how wideawake and capable you are.

This whole matter of doing best for yourself in Aviation depends on your training. You want the best possible start—so remember that Aero ITI trained men are employed readily by all leading aircraft manufacturers, by all leading airlines. You want to move up quickly—so consider well the fact that it is commonplace for an Aero ITI graduate to be on his job only a short time and be placed on important work, or in a supervisory post. You want to be a man regarded by your superiors as "Executive Material"—and that's the way they consider many an Aero ITI man among over 2000 of them out in the industry.

Yes, get into Aviation NOW, but start out equipped with the training for the right start, the fastest progress, and greatest success. Aero ITI can give you that kind of training...not just to <u>get into</u> Aviation, but to <u>stay</u> in Aviation. Find out why—send the coupon NOW.

Aviation Can't Wait for YOU! Send This Coupon NOW

AERO INDUSTRIES TECHNICAL INSTITUTE
5255 West San Fernando Road, Los Angeles, California

Please send information on Aero ITI training for Aviation careers. I am interested in the following branch of Aviation: ☐ Aircraft Mechanics; ☐ Aeronautical Engineering; ☐ Undecided, please send more information. Years High School: ☐ 1, ☐ 2, ☐ 3, ☐ 4. Years College (Liberal Arts): ☐ 1, ☐ 2, ☐ 3, ☐ 4. Years Engineering College: ☐ 1, ☐ 2, ☐ 3, ☐ 4.

Name_____ Age_____

Address_____

City_____ State_____ a-41-PA

AERO INDUSTRIES TECHNICAL INSTITUTE

5255 West San Fernando Road, Los Angeles, California

Five Courses In
AIRCRAFT MECHANICS and AERONAUTICAL ENGINEERING
—Including 12 Month Aircraft Mechanics Course
Approved by U. S. Civil Aeronautics Administration

ADVISORY BOARD

ROBERT E. GROSS
President, Lockheed Aircraft Corporation

JOHN K. NORTHROP
President Northrop Aircraft, Inc.

C. A. VAN DUSEN
Vice Pres., Consolidated Aircraft Corporation

in Economy!

Go Lycoming for more dollars in your pocket! Operators and private owners throughout the country are setting economy records with Lycoming BLUE RIBBON light-plane engines . . burning as little as 2.5 gallons per hour, even in the day-in day-out grind of student instruction. Specify "power by Lycoming" in *your* plane . . . for *extra* economy, *added* comfort and *proved* dependability . . . the FIRST CHOICE engine for civilian and military pilot training.

LYCOMING OFFERS YOU WIDEST CHOICE OF POWER

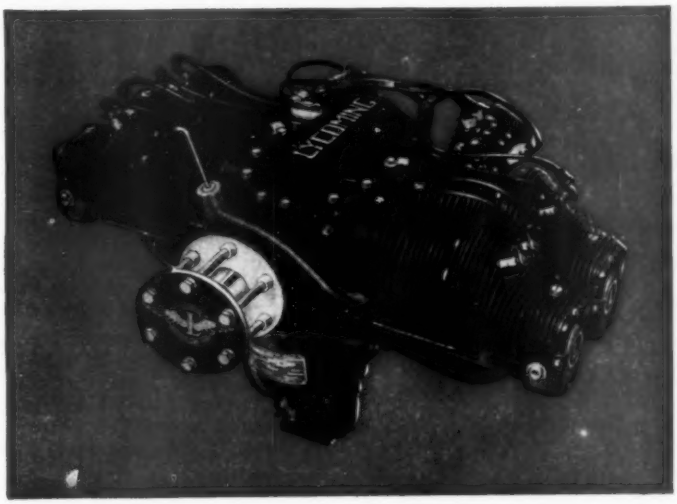
The widest choice of power in horizontally opposed engines offered by any engine manufacturer . . . 60% greater than the second engine! The Lycoming 65-horsepower engine is illustrated. Other BLUE RIBBON four-cylinder models are available in 50, 55, 75, 100 and 125 horsepower and six-cylinder models in 150 and 175 horsepower. All are air-cooled with provision for mechanical or electric starter and accessory drives.

FREE LITERATURE

on Lycoming 50 to 75-horsepower light-plane engines may be obtained from all Aeronca, Funk, Luscombe, Piper, Porterfield and Taylorcraft dealers. Or write Lycoming Division, Dept. P51, Aviation Manufacturing Corporation, Williamsport, Penna., U.S.A. . . . Cable address: Aviatcor. (If you wish literature on the higher horsepower horizontally opposed engines, please specify.)

★

Contractors to the U. S. Army and Navy



YOU CAN RELY ON

LYCOMING

50 to 300 H.P.

Engines

FOR MILITARY AND CIVILIAN TRAINERS ★ FOR PRIVATE AND COMMERCIAL PLANES

FORWARD AMERICA!

ON A NATION OF PILOTS DEPENDS OUR SECURITY

For Low-Cost Pilot Instruction—

TAYLORCRAFT *provides* BOTH

TWO-PLACE "SIDE-BY-SIDE" AND "TANDEM" TRAINERS

TO FURTHER our National defense is everybody's job. The light plane industry is taking an indispensable part by providing the primary trainers and production facilities so vitally necessary to create a "Nation of Pilots". Only light planes can be built quickly in the great quantities needed for primary training of tens of thousands of pilots.

Superior construction and flying advantages have made Taylorcraft the World's largest selling two-place Side-by-Side airplane. Now, with the addition of a new, modern Tandem Trainer BOTH Side-by-Side and Tandem models are available — each incorporating the same qualities that have made the Taylorcraft name synonomous with flying excellence.

Built to take the severe service in the Government Civilian Pilot Training Program, these big, rugged, low-cost Trainers will give wings to new thousands of pilots — help to protect our National security.

Young men of America! Learn to fly — do your part to defend American freedom by helping to make Our Country a "Nation of Pilots". Write for a descriptive folder of Taylorcraft airplanes and information on free flying instructions, today.

Look at these TAYLORCRAFT RECORDS

- Winner of the light plane Firestone Trophy Race for two consecutive years—1940 and 1941.
- Holder of the World's light plane altitude record of 24,311 feet.
- Holder of the World's light seaplane long distance non-stop, non-refueling record of 901 miles.

YOU GET *More* IN TAYLORCRAFT

FIRST IN FLYING QUALITIES

FIRST IN COMFORT

FIRST IN MAINTENANCE ECONOMY

TAYLORCRAFT

TAYLORCRAFT AVIATION CORPORATION
Department 44 **Alliance, Ohio**

EXPORT: Fairchild Aviation Corp., Jamaica, L. I., New York, U.S.A.

Fly **TAYLORCRAFT— AMERICA'S MOST MODERN LOW-PRICED AIRPLANE**

POLLY SMITH PHOTO

"By the Dawn's Early Light"

.....you can see training planes flying through the early-morning clouds.

At all hours of the day, from dawn to dusk, you will find DAS students working toward one goal . . . National Defense. Student flyer or aircraft mechanic; each knows he can serve his country best by getting the right kind of training.

Now is the time to join the growing army of aviation students.

DALLAS AVIATION SCHOOL AND AIR COLLEGE

DALLAS **TEXAS**

Major W. F. Long, PA-5-41
Dallas Aviation School,
Love Field, Dallas, Texas.

Without any obligation to me please send your catalog to:

Name .....

Address .....

City .....

State ..... Age.....

HITLER'S New Warbirds

by Leonard Engel

The German air force, set for the spring drive against Britain, is getting several deadly new types.

Raiding British convoys far at sea are Focke-Wulf "Kuriers," adapted from airliner. Note gun positions under fuselage.

ASSOCIATED PRESS

IN November, FLYING AND POPULAR AVIATION gave its readers the first detailed preview of Britain's new warplanes--the fighters and bombers that swing into action this spring to meet the aerial blitz military observers are agreed the Nazis will launch at that time.

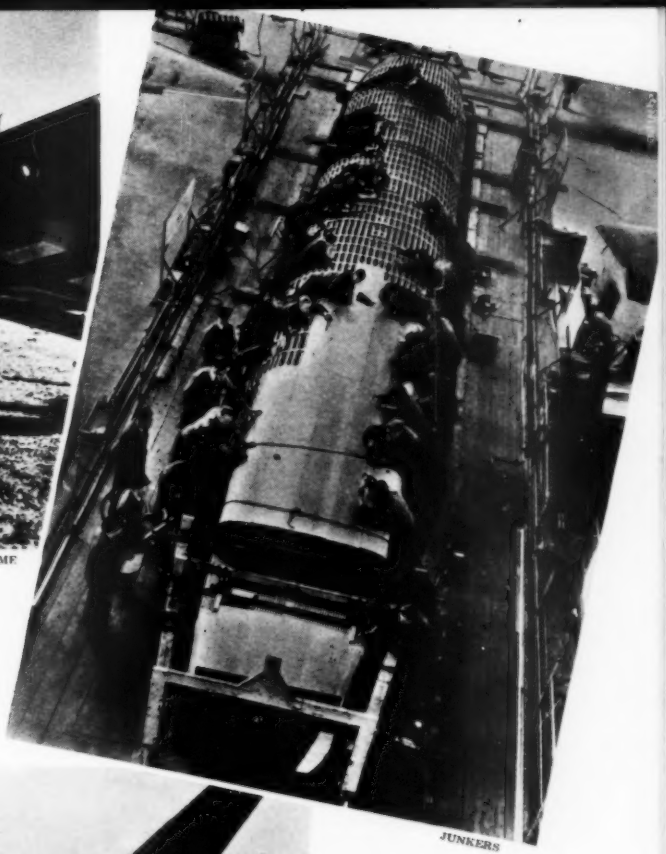
The British have no monopoly on new planes. The last war, in the air, was a continual bitter struggle by each side to develop better aerial fighting machines than the other. So is this war. The Nazis have their new combat craft, too. Here is a report on them, as complete as is possible to give without jeopardizing the sources of the information.

The *Luftwaffe's* first-line fighter squadrons will be equipped this spring with two new Focke-Wulf machines, the Fw-158 and Fw-189, in place of the two Messerschmitts, the Me-109 and Me-110, which are still in use. The Fw-158 is a single-seater, single-engined craft with a pusher propeller. The Fw-189 is a multi-motored two- and three-place job, depending on the mission.

Of new bomber designs, there are four far enough along to have been in large-scale production in time for combat this spring. Others are being worked on and limited production soon may be achieved, but they will not be used this spring, as both the *Luftwaffe* and RAF have found it unwise to place a new plane in service in limited numbers only. A few planes of a new type cannot affect air war decisively; and using them only gives the enemy an opportunity to learn their weaknesses and prepare counter-measures.

Two of the new bombers are four-motored ships, a new Heinkel and the Focke-Wulf *Kurier*. The *Kurier* is a military version of the *Condor*, huge passenger ship in service on German-owned South American airlines, on Lufthansa

ACME



JUNKERS

Expected to come into front-line service, replacing the Messerschmitt Me-109, is the Heinkel He-113 (above). Actually, an old design, the He-113 is a modification of the tricky, dangerous-to-fly He-112. At right are Junkers workmen building fuselage of giant four-engined troop carrier expected to lead invasion.

and, before the invasion, on the Danish airlines. The *Brandenburg*, which flew non-stop from Berlin to New York in the summer of 1938, was one of the first *Condors*.

The other two are twin-engined craft —a Henschel and the Heinkel He-119, which is said to be powered with 2,000 h.p. motors.

The Reich thus has an interesting assortment of new models. It will be noted, however, that fewer new types are to be put in service by the *Luftwaffe* than the RAF. The RAF has three new fighters and a half-dozen new bombers. This is no sign that development work is behind hand in the Reich, but rather a commentary on the progress of standardization and a result of the distinctive system of organization of German military aviation. More of that later. The new line of planes is supplemented by extensive remodeling of some of the familiar *Luftwaffe* machines.

The Fw-158 is powered by a 1,375 h.p. Daimler-Benz (Mercedes-Benz) engine, the DB-603, and is a pusher with both engine and propeller to the pilot's rear. (Closest comparable plane: Bell's P-39—the *Airacobra*—which has a conventional tractor prop up front, but whose engine is behind the pilot. The propeller shaft runs half the length of the ship, passing beneath the pilot's feet to the nose of the plane. The pilot sits on the front end of the gear box.)

The Fw-158's top speed is considerably above 400 m.p.h. I don't believe, however, that it is as fast as the Hawker *Tornado* or *Typhoon*, the RAF's two new crackerjack fighters driven by 2,000 h.p. engines. Nor is its armament as heavy. The British ships carry eight rifle-caliber machine guns and three or four 20 mm cannon; the Fw-158 has two .50 caliber machine guns and four cannon.

The pusher arrangement of the Fw-158 means a few more miles per hour for the

(*Continued on page* 64)

SCHOSTAL

Fast new twin-engined fighter is the Focke-Wulf Fw-189 above. Engines are 1,375 h.p. Daimlers. It has eight guns, including cannon.

ASSOCIATED PRESS

An improved version of somewhat vulnerable Junkers Ju-88 is expected to go into service. Ju-88 is combined horizontal and dive bomber.

Hangar No. 2 at Metropolitan Airport is the home of the Arlen-Probert company.

Super-Service Specialists

by HILL EDWARDS

It is unusual that one of the newest, most progressive fixed base operators on the Pacific Coast also is a noted Hollywood star.

BECAUSE Richard Arlen, motion picture actor, was cheated out of 20 years of flying by high rentals, poor service and all the other inconveniences of flying in the twenties and the early thirties, today's private pilots are getting the breaks. Arlen, who has taken up flying again "because those light jobs are economical and fast enough to go places," has established in southern California one of those flying services the lads who haven't made CPTP training courses, who just fly for the sport of it and haven't enough money to buy their own equipment, have been crying for.

So far, Arlen has invested between $50,000 and $60,000 in a flying service which, to say the least when you judge it from current standards, is "de luxe." He's taken Hangar No. 2, at Metropolitan Airport, Van Nuys, Cal., and has turned it from a spider-webbed, dark and broken-windowed tin barn into a combination club house, lounge, rental service, repair station and storage unit. Among other things, he hasn't forgotten that women like to fly, too, and he's pointing at them with a few innovations that aviation has "sold short," including a powder room. And, while he's busy building up to a new kind of "carriage trade," he's getting his own license back and is doing considerable flying himself.

A year ago, Hangar No. 2 wasn't much to shout about. It had been used mostly for the storage of outworn equipment. Up until then a few movie companies had moved in for a short time, now and then, to make the flying scenes for air pictures.

"I've been watching aviation since I served with and won my commission in the Royal Canadian Flying Corps in 1918," Arlen says today. "I'd taken it up, given up several times during those 22 years, always because of several reasons. One was that there were no facilities for comfortable flying. Another was that there was no decently maintained equipment. A third was that prices were beyond all reason. A fourth was that after you started flying there wasn't any place to go because small towns, resorts and beauty spots had no fields. Still another was that there was no insurance."

Arlen called the turn. He bought out Gordon Buck, a Metropolitan Airport operator, went into partnership with Dick Probert, another operator on the field. The first thing he did was nearly break a spring in his car trying to get into the airport.

"That road," he says, "was enough to discourage anybody who wanted to learn to fly."

So he had it paved. The parking lot was worse than the road. So he had it filled with gravel, arranged so that it would care for 200 cars. He floored it with gravel so that during California's rainy days it would still be usable.

He had all the broken windows in the hangar replaced. He had them washed. Then he went to work with a crew of painters. He had them do the outside of the old hangar in cream. Inside, they went to work with white.

"The visibility was so bad on dark days that you needed instruments to get around inside the place," he says. "The first job was to get the place cleaned out. The second was to paint it. And the third was to start storing ships."

He knew from past experience that

hangar boys had a habit of knocking holes in planes. He gave his men more money than most other operators were paying, got a more careful type of young worker. The new help appreciates the investment which has been made by the pilots who work with Arlen and make their jobs possible. The result is that Arlen's 14 ships—he started with about eight—and those who store with Arlen don't come out to the field to discover holes in wings, dents in pants and scratches on fuselages. He has so far found room to keep 57 ships and believes that he may have to find an "annex."

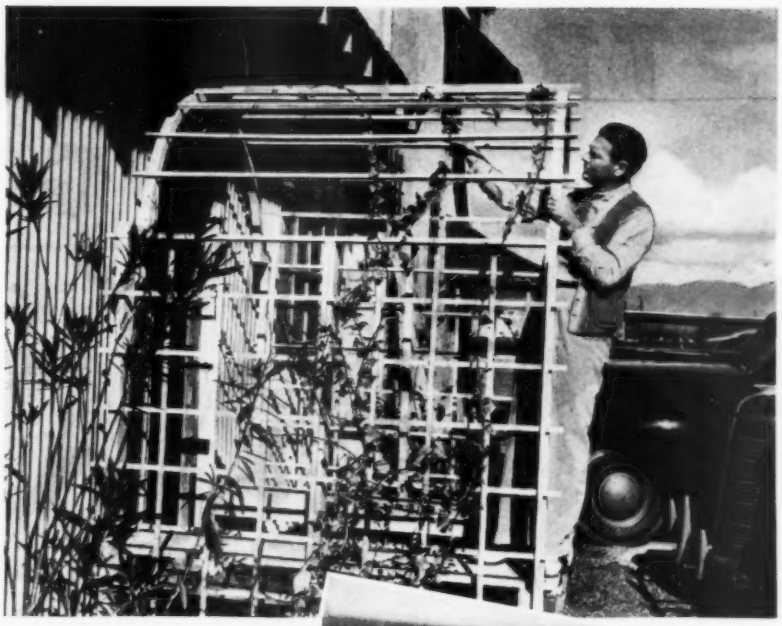
But these few strides were only the beginning. "You may laugh," he says, "but there was no flag on the airport. I mean no American flag. So I had a flag pole put up and the stars and stripes started waving. Not only that, but I hired a gardener."

Old tires, spare parts, beer cans and other odds and ends surrounded the hangar. The gardener gathered up the junk, carted it away, tilled the ground, planted shrubs and trees around the entire building which, incidentally, isn't small time. It contains 24,000 feet of floor space. The next step was to modernize both the offices and the office procedure. There isn't any guesswork in the Arlen system. If you check in at the operations desk and announce what kind of ship you want to fly, Anne Probert, the manager, doesn't "stall." She either assigns the plane you want to you or, if it isn't available, she tells you exactly when it will be.

"Each ship," says Arlen, "was overhauled as fast as we acquired equipment. Everything on the line is in excellent shape and I'll take any plane you choose on a cross-country trip right now."

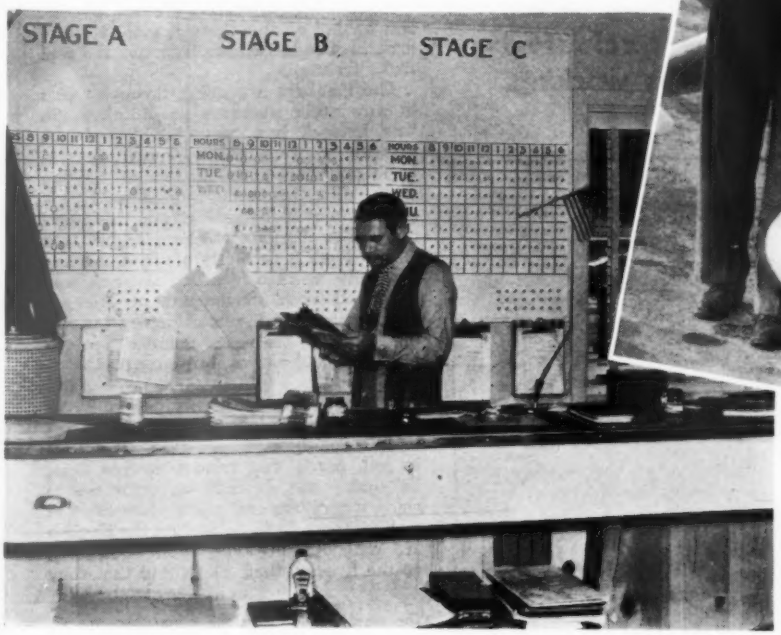
The repair station soon came into being. Arlen and Probert saw that competent mechanics were installed. They saw that

(*Continued on page* 80)



An advocate of attractive surroundings, Arlen likes hangar eye-appeal.

Dick Probert and Arlen pooled their resources to form new corporation.



In addition to regular private-flying customers, Arlen-Probert has 20 CPTP students.

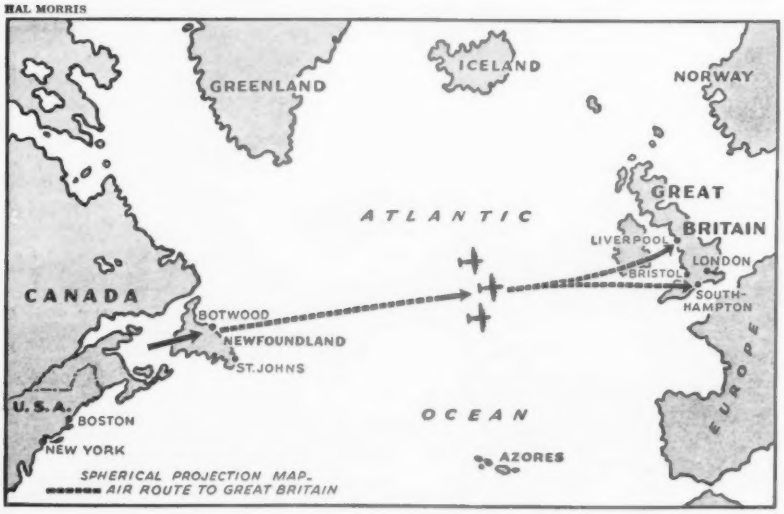
TRANSATLANTIC BRIDGE

Douglas "Bostons," with extra fuel tanks, are being flown to England.

by De WITT WENDELL

American-built warplanes are flying across the Atlantic regularly. This exclusive article tells how well the system is working.

HAL MORRIS



IT is perhaps too close to the era when ocean flying was strictly a stunt to have the American people at large accept as unglamorous the fact that American bombing planes are being delivered by air from Canadian flying bases to military aerodromes in England. The result is a lot of hot air, puff stories and sensational dream articles in the newspapers. But behind all this there is a solid background of sound accomplishment and real flight technique.

The bombers are going through. Not in any great numbers as yet, but the "air bridge" has been established. A growing pool of pilots, navigators and radio operators specially trained for the work will continue the flying already begun in an ever increasing ratio this summer. But not one of these flights is a stunt. Each is carefully planned, mathematically worked out in advance, coordinated with movements of convoys and weather conditions in England. They are strictly business, damned serious business—and almost, but not quite, routine.

It is this story of the business of making these flight deliveries that we want to tell you here. There is a great deal to tell, much that cannot at this time, be told. But enough, nevertheless to show non-flyers and pilots alike that, in making these flight deliveries, the English are not gambling with their equipment or the lives of their pilots and that they

The map at left shows the general route of bombers to some of the British bases.

Bombers take off for Britain from this big Newfoundland base, usually at night.

ACME

have adopted the expedient of flight deliveries from this continent only after being convinced that it is the swiftest, least expensive and most satisfactory method of gettting their planes overseas.

Without naming names we can say that the program for the transatlantic flight deliveries originated at Ottawa with a group of flying officers and a former high official of Imperial Airways the old governmentally-subsidized air transportation monopoly that since has been changed to BOA (British Overseas Airways). At first it was merely squadron mess gossip. Then several engineer officers got out charts, data on airplane weights and loadings and began talking with Imperial's transatlantic skippers who were flying some of the Short commercial four-engined boats to Botwood and Shediac from England before the war.

Range was the problem. Most of the first bombers delivered to the RAF from American factories were twin-engined Lockheed *Hudsons*. A few Douglas *Digbys* were delivered just after war began —the *Digby* is the B-18A— but no more than 20 of these were ordered at any time. The *Digby* was turned over to Royal Canadian Air Force reconnaissance squadrons, but the *Hudson* was badly needed in England and, for nearly a year, deliveries were made by boat.

It was in August and September, 1940, that the first test flights were made. These were with crews from the RCAF flight test section at Ottawa, Ontario. Among them was an American pilot veteran. The equipment they used were *Hudson* bombers, overloaded by nearly 3,000 pounds at take-off because of extra fuel tanks, flotation gear and armament. Today the arms seldom are carried because the English have established air superiority over England and there is little fear that German machines will be met en route. Most of the over-ocean flying is being done at night, anyway.

Fortunately there was no difficulty

(*Continued on page* 68)

INTERNATIONAL

Eager R.A.F. mechanics look over a "Boston" following its arrival "somewhere in England."

ACME

A Consolidated "Liberator" flew from San Diego-New York non-stop at 270 m.p.h.

FERRY HOP

by

Marsh W. Miller, Jr., USNR

Newspaper reports of long overseas flights of Navy patrol bombers have been scanty and lacking details. This writer, a Navy pilot, tells of a recent trip.

The author.

OFFICIAL orders are always of interest, especially when they are your own. I skimmed through the heading written in the concise terminology of the Bureau of Aeronautics: From:—, To:—, Subject:—, etc. It was the text that brought me to my feet. I was to be transferred from my present squadron to VP-26 (Patrol Squadron 26), for duty involving flying as a pilot on the coming ferry trip from the Naval Air Station at Pearl Harbor, Territory of Hawaii, to Cavite, Philippine Islands. Upon my arrival in the Philippines I was to be detached and assigned to duty VP-21, the pioneer patrol squadron in the Asiatic Fleet. They had been operating for eight months from their Sangley Point base at Cavite, on the edge of Manila Bay.

Upon reporting to VP-26 for duty in June, 1940, I couldn't help but look admiringly at their 14 Consolidated PBY's, silver, sleek and shimmering with their retracting floats which snuggled into the wingtips, separated by over 100 feet of streamlined wing. This same type of big boat had successfully operated over most of the seas of the world and would no doubt feel much at home following the footsteps of its brothers over the stepping stones of the Pacific: up to Midway, down to Wake, over to Guam and then into Manila with Cavite across the Bay. These 5,500 miles of open ocean would placidly pass under our wings as these planes hopped, as if with magic wings, from island to island along the route.

After much planning and many conferences, we neared the take-off date. The plane crew list was published. My first pilot was to be a Naval Reserve ensign. Having finished the training as a Naval aviator a year before me, his additional experience qualified him to be a patrol plane commander. The remainder of the crew consisted of myself as second pilot and navigator and four enlisted men: one enlisted pilot, a radioman and two mechanics.

The sun was still below the horizon when we manned our planes on the morning of the take-off. As we sat there on the ramp, carefully checking our engines, controls and instruments, there seemed to be a tingle in the air. We were saying aloha to the Islands. One

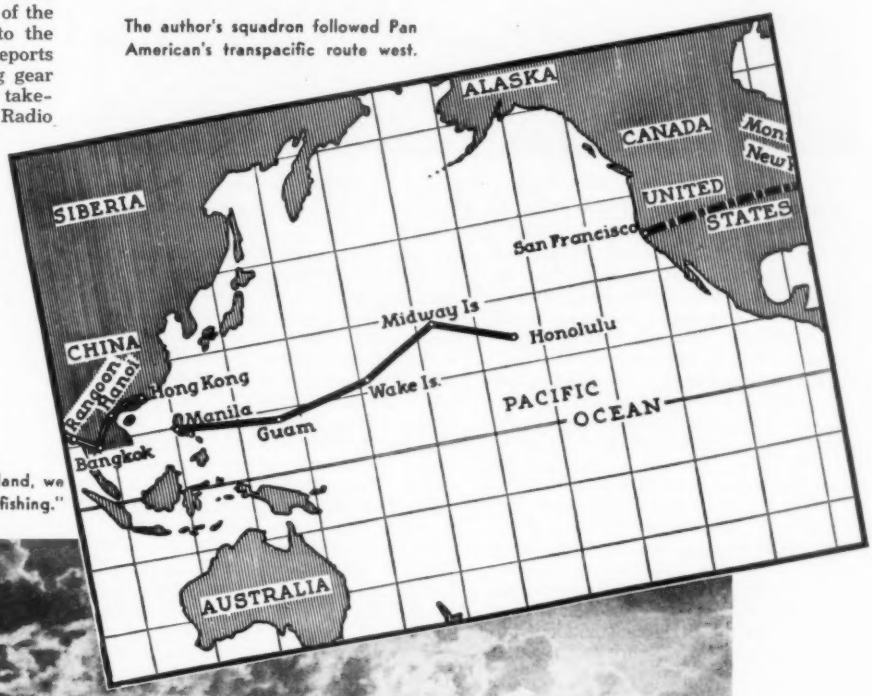
always associates color and music with a hello or goodbye in Hawaii. We had the eerie bluish wisps of flames at the exhaust stacks for our flower leis. The humming of 28 engines, impatient to open their throats, was our music.

Just as dawn came and all the buoys and other possible obstructions were visible, we heard the skipper's voice in our headphones as he asked permission of the flight control tower to launch 14 planes. After the beach crew removed his beaching gear, we could see our No. 1 plane taxi out to the take-off area. Soon it would be our turn. Gill Fraunheim (Ens. Gilbert J. Frauenheim) was in the first pilot's seat on the port side of the plane. I was on the starboard side. We both buckled our safety belts as we taxied to the edge of the ramp. The first division of six planes had already rendezvoused and were circling in formation over our heads. In a moment we could hear the water lapping on the sides of the hull as we swished effortlessly into the harbor. Next came the routine reports from all plane stations: "Beaching gear free, waist hatches closed, ready for take-off. Mechanic ready for take-off. Radio ready for take-off." We taxied out and weather-cocked into the wind, closely following the plane ahead of us in order to expedite the operation. As soon as Gill thought the slipstream of the plane ahead of us had dispersed enough so we wouldn't wallow around trying to get off, he nodded to me. I eased the throttles forward. Gradually the props gnawed great chunks of air, pulling us forward with increasing speed. Simultaneously the engines took up a roar like a thousand lions proud of their strength. Also my heart beat a little faster, thrilled with the prospect of the experiences to come. Soon we were on the step, skimming along the water as our speed built up. The slapping of the water slowly faded as Pearl Harbor tapped us adieu. Within a fleeting few minutes we had been supported by three mediums: land, water and air. A signal to our mechanic and the wingtip floats retracted flush into the wings to form the tips. Well above the patchwork patterns of pineapple and sugar cane fields we took our station in the formation.

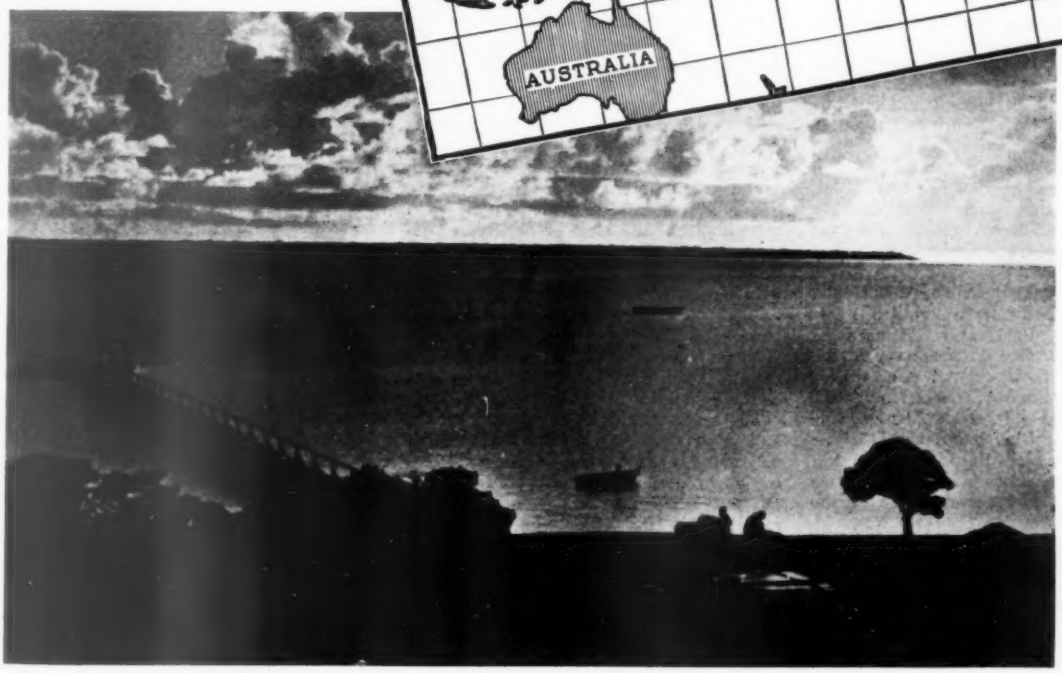
The skipper led us over Barber's Point lighthouse, whose graceful shaft and powerful beacon serves both sea and air travelers. We settled on our course and climbed above the clumps of cottony cumulus clouds before leveling off. At this higher altitude we took advantage of better engine performance and tail winds. Soon we were passing the Island of Kauai and Mount Waialiale, with its usual cloak of drizzling clouds gathered about its massive hulk. As I looked down at this mountain I recalled that this was one of the wettest spots in the world: 35 feet of rain drench this peak each year.

In a short time we were out over the open sea, away from any lee from the island which might throw our wind calculations off. Well aft in the plane, I opened up the tunnel hatch—first making sure my safety belt was secured. Down 8,000 feet to the surface of the sea, I dropped a smoke float. As I watched it diminish in size while descending, I appreciated our altitude, something one is usually unaware of in a plane. A minute

The author's squadron followed Pan American's transpacific route west.



"Staying over an extra day at Wake Island, we enjoyed ourselves with some underwater fishing."



Headed out to sea from Pearl Harbor, the author's squadron spreads out in loose formation for the long trip ahead. Each plane was navigated to Manila independently.

column of smoke, well aft located the float. After averaging a number of readings, I found that the drift was 3° left.

Back at the spacious navigation table, I corrected the indicated airspeed for instrument and temperature errors, getting the true airspeed. In a jiffy, taking my plotting board and applying this data with my wind and heading, I found the ground speed and immediately made an estimate of our time of arrival at Midway. Gill pointed out Gardiner Pinnacle as I gave him our arrival time. It looked like a windjammer under full sail, cleaving the surf that pounded it. Here was a symbol of the old order being overtaken by the new. This speck of land gave me a direct check on my estimated ground speed. With the dividers I laid out our hourly positions in advance for a couple of hours.

With natural beacons in the form of islets and reefs every few hundred miles, this was to be our easiest day's hop. We were flying over broken clouds when we were due to sight the minute disc that is Laysan Island. Our peeking through the holes was in vain, as soon it was well overdue. We had missed sighting it due to the clouds. Pearl and Hermes Reef made its appearance on schedule, off the port bow, its thousands of coral heads looking like so many mushrooms. We should have passed the reef slightly to starboard. Our wind had changed in the last few hours, cutting down our left drift. After a change in our heading we settled down for the remainder of the flight into Midway.

A deeper hue of blue than that of the sky or sea told us that Sand and Eastern, the two islands of the sapphire atoll of Midway were dead ahead. We had come 1,134 nautical miles to reach this haven since leaving the Island of Oahu. In all Navy planes, nautical miles are used instead of the shorter statute miles, for they lend themselves to an easier coordination in operation with ships. Soon we were ashore, watching the "goofy goonies" go through their routine dance of clapping bills, beating wings and stretching necks. Their take-off technique is most interesting. They pick up speed by running directly into the wind and beating their wings. Once in the air they immediately retract their landing gear. These renowned birds are Laysan albatrosses, whose migratory navigation to and from these Pacific Islands is a real accomplishment. Before enjoying the hospitality of the Pan American Hotel, we took a stroll around the dazzling coral sand beach, looking for the glass balls which are carried by the ocean currents from Japan where they serve as fish-net floats. We were individually rewarded, as we each found a small one.

The first entry, in my chart the next morning, was the time of departure. In this way, I started the diary of dead reckoning of the day's hop. Our track was westerly, which caused us to gain an hour's daylight for every 900 miles we raced old Sol. Although the sun was with us, we lost a day as we crossed the International Date Line. We were now in the domain of the Golden Dragon.

The second mech came up and took a look at our position on the chart before relieving the first mech. Cooking, reading and napping filled in their free time. On duty theirs was the exacting job of maintaining the power plant in proper operating conditions, as well as recording readings of all instruments periodically.

With no land fixes to check on, it was time for some celestial navigation. With the bubble octant I "shot the sun," observing a series of altitudes and corresponding times. Solving the astronomical triangle I obtained a sun line. The radio operator took a directional finder bearing simultaneously with my sights. The combination of this radio bearing line and sun line gave me a cross or a fix which was an indication as to our position. The correct balancing of the celestial, radio bearing and dead reckoning data is what makes the good navigator. Broad experience is needed to know what weight to give to each of these methods as they are coordinated. For example, bumpy air will throw off celestial calculations, sunrise effect will cause radio bearings to be in error and changes of wind direction or velocity will vary dead reckoning data. A trend, revealed by a combination of the above-mentioned methods through a series of indications, determines the most pertinent of data.

Our radioman had been giving me the hourly position reports of Pan American's *California Clipper*, which was flying from Wake to Midway. I passed a note up to the seat telling them when to expect our aerial neighbor. A nod and a pointed finger told me that the transpacific flying boat had been sighted. As our combined speeds made the Clipper loom into view, I thought of this predicted meeting as a tribute to the efficiency of modern air transportation, both commercial and military. Here two miles above the expansive Pacific was a modern air highway clearly defined by modern navigational methods.

The Aroma of food reminded me that I was hungry. Aft, in the mechanic's compartment, our caterer-mechanic was cooking a substantial meal. A mech that is a good chef makes a great hit with the plane crew. Brewing coffee is in itself an art at varying altitudes. The conventional cook would go crazy trying to boil something with the boiling point contiually changing with altitude. Saturated by the sumptuous repast of soup, meat, potatoes and vegetables, I settled back to my work.

Wake Island appeared eight minutes before I calculated it should. Our tailwinds had increased in the previous two hours. Each plane did its own navigating, checking on the leader. Ship's weather reports are scattered and infrequent over the Pacific. This leaves the meteorologist with little to base his forecast on. Unfavorable conditions are apt to be met in a flight of this length. A deployment of systematic spreading out of the squadron to allow room between planes for instrument flying is apt to be called for by the squadron commander at any time. This maneuver necessitates the planes navigating independently.

As we looked down at the surf pounding on the outer reef at Wake, and then at the secure colony of Pan American Airways, it was of interest to reflect that this little atoll discovered in 1796 was not settled until 1935. Soon the crystal-clear waters were caressing our hull. As we stayed there an extra day, due to unfavorable weather, we were able to enjoy ourselves in underwater goggle fishing. Swimming beneath the surface, we tried

(*Continued on page* 100)

Flying Cameras

Special openings in new Beechcrafts accommodate vertical and oblique cameras.

U. S. ARMY

This K-3B oblique camera has 12-inch lens, is for views but not mapping.

by ALFRED TOOMBS

With photography playing an important role in the Air Corps, that body has ordered a fleet of camera ships.

SOME months ago, ranking officers of the U. S. Army Air Corps assembled in the low, white War Department building in Washington for a photographic board. These officers, experts on the application of aerial photography to combat, had before them considerable information gathered by American intelligence officers in Europe. These reports, citing what the European air forces were doing with cameras, bore out the contention of many of the men present—that the U. S. must expand its combat photographic service. Members of the board drafted a strong report which was sent to the Chief of the Air Corps, urging expansion of the camera corps beyond anything that had been dreamed of before.

Now, those who urged that the photographic service be built up have gotten their answer. That answer is a fleet of ultra-modern "flying cameras," the latest thing in aerial military photography. The first have been delivered and formed into the First Photographic Squadron—a unit unique, in most respects, in the world's air forces. For these are planes that were built for the sole purpose of taking military pictures and assembled in units which can be sent roaring out to bring back within the space of a short time a set of photographs covering nearly 50,000 square miles.

The formation of this First Photographic Squadron is only the beginning. Money has been provided for improved planes which will form additional squadrons. The new model "flying cameras" will far surpass those which have just been put in service and will undoubtedly surpass any military planes of their kind ever built.

The First Photographic Squadron has been given a sort of special-assignment status, in a rough way comparable to that of the GHQ force. The squadron consists of 15 planes, designated by the Army as Type F-2. They are twin-engined Beechcrafts, Model 18S, built by the Beech Aircraft Corporation, under a contract for $528,749. Through sliding doors in the belly of the plane, the lenses of two cameras point earthward. In the top of the cabin and in the side door are panels which can be removed so that hand held cameras may be projected. There are special yokes which fit in the place of the panels, lined with sponge rubber so that the camera can be rested on them. In the tail of the plane is a small darkroom, where film magazines can be reloaded while in flight or film developed.

The navigator uses a gyro-stabilized drift meter which adjusts by a cylindrical bar to his right. There are two oxygen drums to a man and the cabin is warmed by heat intakes from the motor exhaust. The plane's ceiling is around 25,000 feet. The planes of the First Squadron carry no armament. But it is planned to include machine guns, as well as more adequate protection for the crew, in the improved version of the flying camera.

The Army's Beechcraft is an all-metal, low-wing monoplane of a gross weight of 7,000 pounds. Its power consists of two Pratt & Whitney nine-cylinder radial engines, each rated at 350 h.p. Wing span of the plane is 47½ feet and it will accommodate, besides the pilot and navigator, two and possibly three photographers.

The plane cruises at around 200 m.p.h. and, except to strengthen it as a fighting

Special mountings have been designed for the Army's new camera planes, facilitating the most precise air mapping.

unit, there is little point in increasing this speed in the new models. It is a strange thing, but the speed of the flying camera must be limited by the photographic equipment it uses. For aerial work of this kind, a between-the-lens shutter must be used on the camera. No shutter of this type has yet been invented which is speedy enough to work from a plane which is really traveling at high speeds.

Photographic officers of the Air Corps have been delighted with the first model flying cameras, which have been spotted at important air fields in all parts of the country. For some time these officers have felt the need for planes which were specially designed to do the camera job. Bombing planes, of course, always have carried cameras and observation ships have been fitted out for photographic reconnaissance and mapping missions. But it is not the best idea to cut holes in observation ships so you can stick a camera out. A special feature of the design of the flying camera is a frame in the fuselage to give the plane extra strength around the hole through which pictures are made.

There are other advantages. The ship is extremely steady—having been built for stability rather than maneuverability — and holds its course with a minimum of attention from the pilot. Since these planes are used quite often in mountainous areas, they have been built for short take-offs and landings on small fields. In case of bumpy landings, straps are fixed inside the cabin for the photographers.

The photographic plane was designed to accommodate any of the cameras which are standard with the Air Corps, including the new color cameras. But it is especially well suited to fly the huge T-3A mapping cameras. In reality the T-3A is two cameras which are mounted in tandem on the floor of the plane. It has 10 lens which were ground to match exactly. The center lens shoots straight down, while the others go off at angles—some as much as 45°. The lens have a six-inch focal length, rated at *f* 6.8, with shutters that have speeds from 1/40th to 1/90th of a second.

On the floor of the cabin, near the cameras, is a central control box from which emanates the electrical impulse that opens the lens. All 10 lenses must open at exactly the same split second every time, since the difference of even 1/500th of a second in any one of them would spoil a shot made from a speeding plane. They are closed by springs.

Reasonably clear weather is requisite for mapping work. Before the plane takes off, some observation must be made of cloud conditions and the pilot must decide at what altitude he can fly so as to stay below the clouds. The altitude at which the trip is to be made will, in most cases, determine the focal length of the camera to be installed. The crew gets its orders before the plane takes off as to the territory which is to be mapped. The proper cameras are installed, the magazines loaded with strips of films that are perhaps 100 feet long and which will make over 200 exposures.

After the plane takes off it climbs to the appointed altitude and heads for the point at which the mapping mission is to begin. The navigator sets the course in a straight line, checking carefully on the "crab" caused by side-winds. The development of a solar navigator which holds planes accurately to a predetermined line of flight over the ground—thus enabling extreme accuracy in the overlap of photographs in a strip—has made the photographic job much easier. A unique combination of sun-compass and drift indicator, the navigator guides the flight accurately despite wind drift or even variation in drift so that a true ground course can be held. The minimum accuracy of the navigator is 0.25 degrees, which means that strips a hundred miles long or more can be flown perfectly parallel.

In addition to keeping a straight course, the pilot must keep his altitude constant, never varying more than 100 feet along the entire flight. To do so would throw the whole picture off scale, since the map ultimately must be assembled from a series of pictures made to exactly the same scale.

An interphone connects the navigator and pilot with the photographers, who are seated toward the middle of the ship. The pilot's instrument rests on a wall bracket while not in use. The navigator also has a hand-controlled transmitter. When the plane is set on the course, the photographers are notified. One of them is watching the ground through a view finder, which is rotatable in azimuth. The other winds film and handles adjustments on the forward camera.

The chief photographer must keep the camera level, adjusting it according to a spirit level beside the camera. In most missions, there will be a large overlap from one picture into the next—as much as 60 per cent. Watching the ground through his lined view finder, the photographer determines the interval between shots by using a stop watch which is part of the camera.

The film must be wound slowly with two large cranks. If wound too fast, the negatives will be streaked with static electricity. The interval between shots may be a minute or as little as 15 sec-

(*Continued on page* 101)

The Air Corps recently bought 15 F-2's at a total cost of $528,749 (approximately $35,249 each). The F-2, an adaptation of the Beechcraft commercial model 18S, carries oblique and vertical cameras.

McDonough (flying lower ship) made several pre-record dives to feel out the P-39. Note pilot's auto-like door.

'SPEEDY'

by C. A. BELL

Andy McDonough is the quiet young fellow who dove a new Army fighter 620 m.p.h. a few weeks ago. He'd like to try for 700.

LIEUT. ANDREW C. McDONOUGH stood up in Judge Luke Arnold's court in Atlanta, Ga., and heard a policeman declare that he, McDonough, was driving his car at the reckless speed of 40 m.p.h. down Peachtree street, where the speed limit is 25 m.p.h.

"But, judge," said the youthful Eastern Air Lines pilot. "I thought I was just creeping along."

He was correct in thinking that McDonough was the same pilot who dive-tested an airplane 620 m.p.h. January 8 at the Buffalo airport? asked the judge. He was, said McDonough, wondering how much this was going to cost him.

"Well, then," said Judge Arnold. "I agree that 40 m.p.h. must seem like 'creeping' to you. Sentence suspended."

The moral of this little tale would seem to be that a pilot who wants to hurtle down Peachtree street in Atlanta at 40 m.p.h. had better fly an airplane 620 m.p.h. first, in order to have an alibi ready for an understanding judge. Right now, however, Lieutenant McDonough is the only one in the world ready with such an alibi. He is the only man ever to have reached the speed of 620 m.p.h., or any speed really close to it in any kind of machine.

McDonough performed that feat in the sleek *Airacobra*, pride of Bell Aircraft Corporation at the Buffalo airport January 8.

McDonough is confident that the *Airacobra* is America's answer to England's *Spitfire* and Germany's Messerschmitt. He thinks it is faster, just as maneuverable and capable of as much firepower.

"It's a pretty good ship," says McDonough, in a triumph of understatement. "It is very maneuverable, stable and very rigid. Its armor plate it thick and strong enough to turn aside any fire except probably a direct hit by a 37 mm. cannon shell. The pilot has additional protection in bullet-proof glass and the gas tank is protected by a self-sealing lining."

McDonough's regular job is flying the Chicago-Atlanta Eastern Air Lines run.

The ship, as the 29-year-old transport flyer dived it, has a 37 mm. cannon firing through the nose, two .50 caliber machine guns and two .30 caliber machine guns. In addition, provision has been made for the installation of four more machine guns in the wings, which would double the converging fire power of the automatic weapons. Eight machine guns and the 37 mm. cannon would put the *Airacobra's* firepower ahead of the *Spitfire*.

American ships with the durability of both engine and body, such as the *Airacobra* possesses, should outlast 10 of Germany's in ordinary wear and tear—if not shot down—McDonough believes.

"American—, as well as English-built engines have a high normal lifetime, whereas Germany's last only an average of 50 hours, I understand," says McDonough. "However, with the German's efficient overhaul system, they are supposed to be able to change engine in 12 seconds. So it all depends on the objec-

(*Continued on page 72*)

FIVE MEN and a PLANE

by EDWARD CHURCHILL

Contrary to popular belief, everyone in Hollywood is not a millionaire. So these radio men pooled their resources to finance a plane.

Bill Goodwin and Penny ("Blondie") Singleton look for private flying tips (top). Directly above are Garred, Johnston, Piersall and plane.

BUYING a three-place airplane, just a year old, for $140 isn't hard to do—not if you work it out right. Payments of $26 per month compare favorably with the obligation you assume when you buy the least expensive of automobiles on the installment plan. Certainly, you wouldn't kick at a hangar charge of $4 per month, or a fee of $1.50 per month for oil changes and minor mechanical adjustments.

It can be done—but, of course, there's a catch. You have to have four other flyers to go in with you on the venture. Such a venture has been undertaken recently by five rather well-known young men. In spite of tales that, in Hollywood, money grows on trees, lots of people can't afford to buy an airplane outright and maintain it for their exclusive use.

Consider the case of Russ Johnston, program director at Hollywood for the Columbia Broadcasting System. He has a private license, wants to fly, has a handful of obligations. He looked around the office, then a little bit beyond it and here's what he found:

Wendell Niles, who announces the Al Pearce program, ex-band leader, ex-flying school operator and ex-flying instructor, who learned to fly in 1926, has more than 1,000 hours to his credit and wanted to get the feel of the controls again. Niles is married, has a wife who shares his enthusiasm.

Blond and handsome Bill Goodwin, whose voice you've heard just about as often as anyone outside your immediate family and who at present is announcing both the Bob Hope radio program and "Blondie." He's married, has a solo license and 50 hours.

Bruce Piersall, Columbia Broadcasting Company engineer. Married, 100 flying hours, student license.

Bob Garred, newscaster. Student license, not far from solo.

"Listen, fellows," Johnston told the assembly. "I want to fly. You want to fly. Let's do something about it."

"What?" they asked. "Rent a five-place ship and all go for a hop?"

"No," replied Johnston. "Let's buy an airplane."

They found a used Stinson "105" which had been carefully maintained and didn't have too many hours on it. Eighty horse-

Russ Johnston (on ladder), Bob Garred and Bruce Piersall watch mechanics check over their plane.

power, 1940 model, with generator and starter. They inspected it carefully, relying on the judgment of Niles, who has known airplanes ever since the days of the low and slow JN4D. The price was $2,500. It looked all right, Niles said it was sound, the price didn't seem too steep and the salesman said they could have it on the time payment plan. With insurance, of course.

"And we're glad we have the insurance," Goodwin told me. "If a group buys a plane which isn't insured and one stacks it, the rest are left holding the twisted fragments. The insurance automatically answers a lot of problems. One of 'em is, 'If something happens to somebody else, do I get my money back?' and another, 'If somebody else hits something and we as owners get sued am I stuck?'"

[*They were wise, all right. Johnston cracked up the ship in Arizona as this article went to press.—Ed.*]

The down payment was $700. That makes an initial outlay of $140 per partner. Payments were pro-rated on the balance, including insurance. Each one found himself paying $26. Add to this the $4 for hangar rent and the $1.50 for mechanical work and oil changes and you have the base figure—$31.50 per month.

Now for the flying. Each member buys his own gasoline—and *always fills the tank before leaving the airport after flying.* That makes the gasoline issue a simple one. If you fly out one gallon or empty the tank you've bought back the amount you have used. The next fellow starts out fresh. Through flying, he knows exactly how much he's used. It's the easiest method of bookkeeping ever devised.

"So far," Goodwin says, "the gasoline end of it, like everything else, has worked without a hitch."

There's a fine for not filling the tank at the end of your flight. It amounts to the cost of gasoline which wasn't in it at the time the next member got the ship plus $1. The dollar goes into a sinking fund to be used in defraying any unforeseen mechanical difficulties.

Another problem, made necessary by a need for flying check-ups, has been the employment of an instructor. That is simple, too. The individual who wants instruction simply goes to Instructor Johnny Woods at Metropolitan Airport, Van Nuys, where the plane is hangared and serviced at a rate of $20 per month, and buys whatever time he wants. Woods, because he knows the fellows, and because they assure him a small definite income, makes a very nominal charge for check time. At the moment Bob Garred is his best customer.

Wendell Niles.

Now, what of total costs? Supposing a member flies 30 hours per month? Add to the base figure of $31.50 approximately $30 for gasoline at 22 cents a gallon and you have just a few cents more than $2 per hour for your flying time. Roughly, two cents a mile as against about four cents for the upkeep, use and depreciation on your own light automobile. And remember this—with each passing month each member has a greater equity in the plane!

On a rental basis the lads couldn't fly 30 hours. First, because today ships are available for only half-hour and one-hour periods, in most cases; and second, because rental of a similar ship would cost approximately $240 for a 30-hour period.

(*Continued on page* 95)

Aircrew recruits in low-pressure chamber, wearing oxygen masks, are "flown" to high altitudes and checked by the observer (inset).

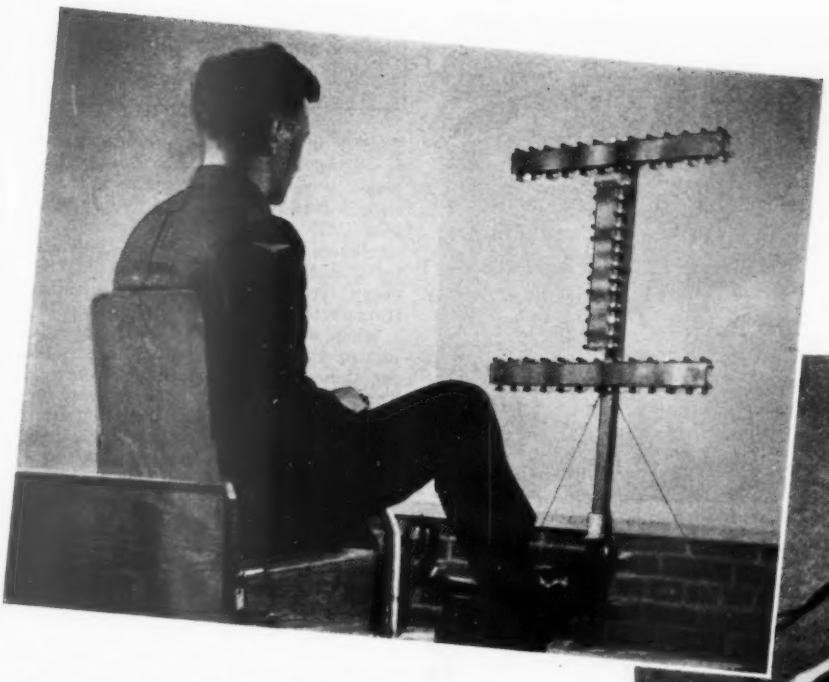
Test Tube ACES

by James Montagnes

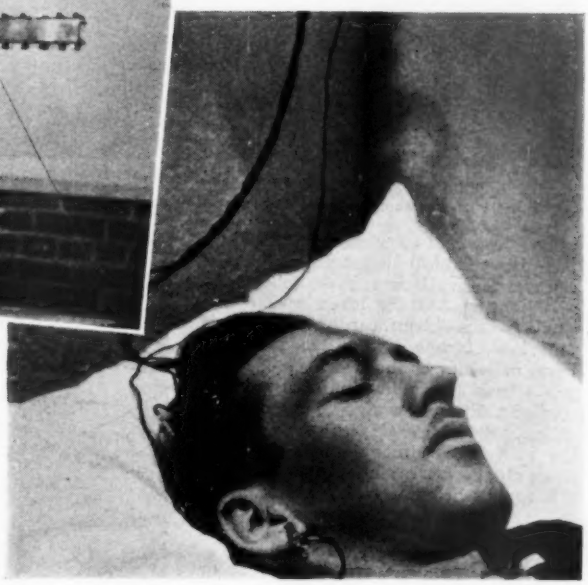
Would-be Royal Air Force flyers, in training in Canada, undergo the most scientific physical tests yet used to ascertain their ability to withstand strenuous flying.

IN an attempt to select suitable men for pilots, observers and navigators, needed by the thousands for the British Commonwealth Air Training Plan, the Royal Canadian Air Force has set up a clinical laboratory at Toronto where prospective aircrew members are put through numerous medical and psychological tests as part of their initial training. The work is still in an experimental stage, results of the investigations not yet having been made public and this method of picking aircrew members not yet having been placed on a practical basis for selection purposes. So far the experimental clinical tests are not designed to disqualify men from flying duties.

Primary reason for the clinical laboratory is to put into practice the latest scientific methods of determining reaction of men under modern airfighting conditions. Investigations of the research unit are destined to save both time and money in training men who would be unsuitable in action though they may measure up to all physical conditions for aircrew members. Expensively trained aircrews as well as expensive airplanes in the hands of pilots who cannot stand the pace of a modern air battle, might be fatal. To eliminate as far as humanly possible such conditions, the research work is being carried out by the recently estab-



To test his co-ordination, flyer moves rudder bar and stick until lights are equalized. Below, the brain waves of a flyer are tested on wave-measuring encephalograph.



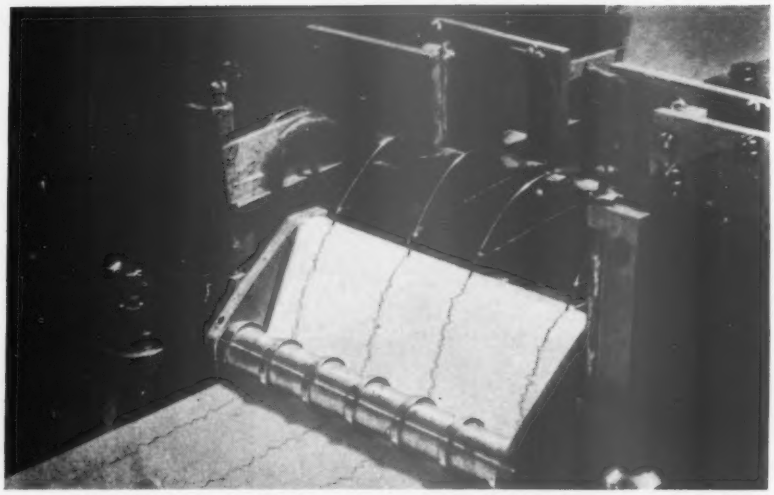
lished Royal Canadian Air Force Medical Service.

The medical section is headed by Group Captain R. W. Ryan, a medico from the Royal Air Force of Great Britain. Doctors for the most part are members of the Royal Canadian Army Medical Corps who have been transferred to the Royal Canadian Air Force, wear air force uniforms with a gold plated "badge of Mercury" on their tunic lapels, the distinguishing mark of the air force medical corps.

The doctors have to have a basic knowledge of the simple aeronautical sciences and, if possible, have done flying. They are trained in the duties and requirements of aircrew members, are given actual flying experience and make a special study of the effects of high altitude flight, high speed, vibration, cold and heat on the human body. Those picked to conduct the clinical tests at the No. 1 Initial Training School at Toronto are army medicos who have specialized in aeronautical medicine for some years.

While the medical selection boards eliminate men who have certain physical conditions which from past experience are known to handicap a flyer, these physical conditions are not apparent in the ordinary medical examination. The clinical investigation unit has created equipment in its laboratory which precisely simulates conditions at any altitude desired and at any degree of speed. Special attention is paid to see if recruits have any heart damage resultant from mild or unnoticed rheumatic fever in childhood. This condition might never become known from a normal life on the ground. But once the flyer encounters abnormal conditions in the air the results might well be fatal, not only to himself but also those in the care of the pilot as well as the plane. The first-class athlete with a potential cardiac condition might well succumb to the lack of

The spirometer records the breathing pattern of an R.C.A.F. flyer as part of the vital capacity tests now given all flying recruits by the clinical unit at Toronto.



In testing the flyer's co-ordination, this recorder graph is made on each man. It is part of the complex hand-and-foot co-ordinator being used in the clinical tests.

oxygen he would encounter at 12,000 feet.

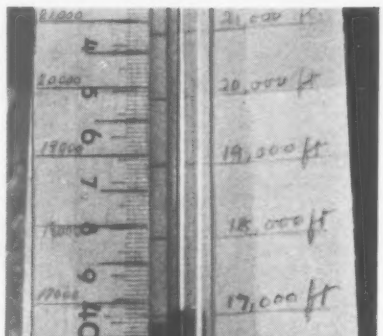
Ordinary clinical means will not always discover these relatively mild weaknesses of the heart, but the investigation unit employs the electrocardiogram which produces a graphic record of the electrical activities of the heart.

The brain as well as the heart is being studied and much work is being done in defining the characteristics which best fit the man to be either a pilot, a gunner or an observer. A relatively new science, electroencephalography, has been utilized to learn about the "brain waves" of the young airman. The brain, like all nervous tissues of the body, gives rise to electrical potentials which can be led off the scalp by means of silver electrodes and amplified through vacuum tubes and recorded on moving paper by ink-writing pens attached to an oscillograph. The electroencephalograph, in general, is to the brain what the electrocardiograph is to the heart. This type of work is being correlated with the practical work of the gunners, observers and pilots as they go through their training courses.

Records are also taken of the breathing pattern of each individual. This is done by using a simple spirometer which records the rate and depth of respiration as well as the regularity of the breathing. Specific correlations have been made on airline pilots and it is also known that certain types of breathing are associated with various psychological and emotional states.

Work also is being done to find those airmen who may not be able to accustom themselves to the drastic changes in position which their air duties impose. Some are so sensitive and experience such nausea and feebleness that their efficiency is dangerously impaired despite the fact that their courage would have them carry on. Equipment is being used which closely simulates changes in positions and thus enables authorities to weed out those who would otherwise ultimately prove unsuitable.

Every recruit going through the No. 1 Initial Training School at Toronto is put through the low pressure chamber, which



Installed on the low-pressure chamber is this mercury manometer showing altitude.

can be evacuated so as to approximate the pressure changes corresponding to any altitude. This equipment is primarily a training unit but at the same time certain clinical information is obtained on each person using it.

The airman, wearing an oxygen mask, goes into the low pressure chamber with a trained observer. On padded seats he goes through many of the sensations of flying, created by an operator outside the chamber who varies the pressure up to 25,000 feet, who can "fly" the chamber into ascents and descents. During the testing the recruit is given practical demonstrations of when to use and when not to use oxygen. Under certain conditions his vision is decreased, hearing affected, the co-ordination of movements made sluggish. The reactions of each are recorded by the operator from beginning to end.

(Continued on page 103)

Canadian Production

by M. O. Payne

EARLY in 1941 Canadian aircraft plants will be turning out 360 military airplanes a month, according to a recent statement of Munitions and Supply Minister C. D. Howe. Already 700 of 3,800 airplanes on order have been delivered by Canadian plants which are making every type of plane from elementary trainers to twin-engined bombers.

When war broke out Canada's aircraft industry was working on trial orders for the Canadian and British governments. The few plants in the industry, scattered from coast to coast, were just beginning to expand for a wartime industry. Canada, which supplied close to 3,000 airplanes in the first World War, had only the skeleton of an aircraft industry a year ago. Airplanes had always been imported from the United States and Great Britain, with only a few private planes, a few bush freighters and flying boats made in the Dominion under license from American and British companies.

Today Canada's aircraft industry has rapidly expanded. Over 17,000 persons are now engaged in the industry, according to Minister Howe. And the Canadian government itself has gone into the aircraft manufacturing business to supply basic bomber types needed for the British Commonwealth Air Training Plan. These planes Great Britain was to have supplied but, after the Flanders disaster, it was felt that these would not be forthcoming and Canada set up its own publicly-owned aircraft production corporation. Since then Britain has sent a large number of these planes to Canada, but production has started and the first of these 1,500 Canadian-built twin-engined Avro *Anson* bombers will be ready for use before the end of the year. American engines have been imported for them.

Eight Canadian aircraft companies have in hand orders for approximately $125,000,000 for the 3,800 airplanes. Some parts are made by other than aircraft companies and some of the companies are only working on British government orders. Instruments and propellers are still imported, but are expected to soon be made in Canada. All engines are imported, primarily from the United States.

Airplanes being made in Canada now include Fleet primary trainers, de Havilland *Tiger Moth* primary trainers, Fleet "60" advanced trainers, Noorduyn *Norseman* radio and observer trainers, North American *Harvard* trainers, Avro *Anson* twin-engined bomber trainers and, for fighting Westland *Lysanders*, Hawker *Hurricanes*, Bristol *Bolingbroke* bombers, Handley-Page *Hampden* bombers, Vickers *Stranraer* flying boats.

So satisfactory has Canada's rapidly expanding aircraft industry proved that the British government recently gave one company an order for 600 *Hurricane* fighters, this company having completed a trial order for these planes. This is so far the biggest single order placed by the

(Continued on page 86)

THE British have named it *Lightning*, the U. S. Army calls it P-38D. The former is more appropriate, for Lockheed's 2,200 h.p. fighter is the most literal bolt-in-the-blue yet. On this page you see a typical test flight of the P-38D version, with Test Pilot Milo Burcham getting a pre-flight exam, taking off and flying high to report results to engineers (right) by radio. Original P-38 had engines turning toward fuselage; revamped P-38D reverses this. Evidence of high performance is propeller pitch: 52.5°. R.A.F. and Lockheed engineers now are working on pilot escape-hatch.

Flying an airplane is one thing, but the capable officer also must know his mechanics.

These are some of 120,000 text books written by Randolph Field instructors for schools teaching Army flying cadets.

THE ARMY

by Major Roland Birnn

If you are thinking of becoming an Air Corps officer, here is an outline of what the Army expects its pilots to know.

Most modern warplanes use superchargers, so pilots must be thoroughly familiar with their operation.

WANTS THEM SMART

IN the pamphlets published by Army authorities, distributed by many agencies and military headquarters and read by many more young Americans who want to fly, appear statements to the effect that those candidates who have not completed one-half the necessary credits leading to a degree must be able to pass a written examination in lieu thereof. College grads and those who have the necessary college credits pass over that part of the pamphlet, happy for the moment—until they come to "PHYSICAL REQUIREMENTS." The lucky or optimistic ones even read through that section without a stagger and wonder to whom they should write for an application blank. But thousands upon thousands of lads wonder just what is meant by the words "written examination in lieu thereof." Is it college stuff? Will it phase a smart high school grad? Does it really cover the material in those books listed as representative texts?

Let us look at a sample list of questions, asked on a previous examination. Limitation as to space does not permit writing the complete list, but the ones given here are representative as to quality and the time needed for answering them. There are certain conditions. Not more than two hours is allowed for any one of the nine subjects (actually some may be completed in 30 minutes). The passing grade is 70 per cent; each subject has equal weight and the final grade is the average grade received in the combined subjects. If the candidate fails in the writen examination he must wait three months before taking another.

It having been many years since the author attended high school and college, he captured a human guinea pig, a recent graduate of an excellent high school in which he had taken but three years of one language, but had made extra credits in intermediate physics, solid geometry and trigonometry. This human laboratory passed fairly well indeed in answering the sample questions given below, but admitted that it would have been quite difficult for him the longer he had been out of school. The author would rate him as an above-average student. It will be noted that he specialized in the more difficult subjects given in the flying cadet examination. It is possible that many good students with one year of college work or even more, have never had trigonometry or physics. However, there are certain text books suggested for each subject and nothing should prevent a man capable of graduating from high school from boning up on his own hook and making the required 70 per cent. That is, if he's determined enough to be one of Uncle Sam's flyers and has the something-or-other that makes him do something about it.

Following is a sample cross-section from a previously held examination:

ENGLISH GRAMMAR AND COMPOSITION.

This consists of two parts: the preparation of an outline for an essay on any one of a half dozen or more given subjects and then the expansion of one part of your outline into 75 to 100 words to make part of a complete essay. The work is graded on organization of material, clarity of expression, spelling, grammar, punctuation and penmanship. Subjects given were: Modern Transportation. My Hobby. Can War Be Abolished? Should Commercial Advertising on the Radio Be Banned? Should Autos Be Equipped with Governors?

Examination in this subject will require the ability to express clearly ideas on subjects of common knowledge. It is significant to note that in a recent issue of a service journal, an Army officer expressed concern that so many of his fellow officers were unable to write a report or an order in good English. The scope of this part of the examination is that covered by Wooley's "New Handbook of Composition."

UNITED STATES HISTORY.

The text mentioned in the War Department's flying cadet pamphlet is Muzzey's "An American History." In a previous examination, there were 43 questions, of which 21 typical ones are given here. The author's guinea pig dashed through the 43 original ones in 22 minutes, then spent another 10 minutes in reviewing the doubtful ones:

1. Virginia was named in honor of .....

2. Rhode Island began with the establishment of a colony at Providence by .....

3. Having no charter the Plymouth colonists signed the ..... as a basis for civil government.

4. For defensive purposes the colonists of Massachusetts, Plymouth, Connecticut and New Haven united to form the ..... in 1643.

5. Braddock, an English general, attacked Fort DuQuesne located at a site now occupied by .....

6. The delegates from the various states in 1777 submitted the ..... as a plan for the government of the league of states. This plan was finally adopted in 1781.

7. The constitution provided that in determining a state's representation in congress, a portion amounting to ..... of all slaves should be counted.

8. An amendment to the constitution requires ratification by ..... of the total number of states before it becomes effective.

9. Shay's rebellion took place in the state of .....

10. The ..... begins with the words "We the people of the United States in order to—"

11. ..... was known as the "Great Compromiser."

12. Under the provision of the Missouri Compromise of 1820, ... and Missouri were both admitted as states to preserve the balance between slave and free states in the senate.

13. Washington's first cabinet consisted of three administrative departments, ..., ... and .....

14. The ..... begins with the words, "When in the course of human events it becomes necessary—"

15. The qualifications for voters in national elections are set by the .....

16. Picketts' charge on Cemetery Ridge was the turning point in the battle of .....

17. The Whig candidate for the presidency, Harrison, was elected in 1840 with the slogan "Tippecanoe and ..... too."

18. The U. S. S. ..... was blown up in Havana Harbor on Feb. 15, 1898.

19. Three men elected to the Presidency of the United States have been assassinated: ..... and .....

20. President Roosevelt's cabinet in May, 1940, had among others the following members: ..... as Secretary of State; ..... as Secretary of War; ..... as Secretary of Navy; and ..... as Secretary of Labor.

21. The ..... River is being dammed as part of the great hydro-electric project under the T.V.A.

GENERAL HISTORY.

The book suggested here is "History of Civilization" Vol. I, "Earlier Ages" by Robinson, Breasted, Beard and Smith. Examination in this subject will require a knowledge of the important facts from general ancient history up to the discovery of America. Here are 16 typical questions from a list of 31 given in a previous examination.

1. The Egyptians left records written

Before he takes actual flight work, this flyer must pass the exam on this page.

in a type of picture writing called .....

2. The leading city states opposing each other in the Peloponnesian Wars were ..... and .....

3. The ....., a tablet found near the mouth of the Nile, contained inscriptions in the Greek, Egyptian and Babylonian languages and aided in the translation of these old languages.

4. Slaves in ancient Sparta were known as .....

5. The chief state officers in early Athens were called ..... There were nine of them elected for a period of one year.

6. The Greek city states' contribution to later peoples was the ..... form of government.

7. The lower classes of Roman citizens were called .....

8. Caesar, Pompey and ..... governed Rome as the First Triumverate.

9. Among the important voyages of discovery during the 15th and 16th centuries were ..... discovery of San Salvador, ... voyage around Cape of Good Hope to India, ... circumnavigation of the globe in 1518, ... discovery of the Pacific in 1513, and ..... voyage to Labrador in 1497 upon whose discoveries England later made her claims to the new world.

10. The War of the Roses was a struggle between the houses of Lancaster and ..... for the English throne.

11. George I of England was the first of the house of ..... to govern England.

12. The Magyars are a group of people living in .....

13. The original members of the Holy Alliance were ....., ... and .....

14. The steam engine invented by Newcomen was perfected and made practical by .....

15. Name the government existing in the following countries in March, 1940. Sweden ..... Holland ..... Belgium ..... France ..... Brazil .....

16. Gustav V was King of ..... in March, 1940.

GEOGRAPHY.

The scope of this section will be that covered by "Advanced Geography" by McMurry and Perkins (2nd revised edition). Many a candidate taking this part of the examination will remember the answer to some of the following 25 of a list of 50 previous questions from poring over maps and aeronautical charts.

1-5. Name the five Great Lakes.

6-7. State capital of Florida; of Idaho.

8-9. Two largest branch rivers which flow into the Mississippi.

10-11. U. S. state which produces the most coal; the most gold.

12. Main industry of Alaska.

13. U. S. has either 6, 8, 10 or 12 per cent of the world's population. Which is correct?

14. What country is just north of Costa Rica?

15-16. Two South American countries which have no coast line.

17. Rio de Janeiro is the capital of which country?

18. Location of Cape of Good Hope.

19. Which is southeast of India: the Arabian Sea, Bay of Bengal or Persian Gulf?

20. U. S. city which was third largest in population in 1930.

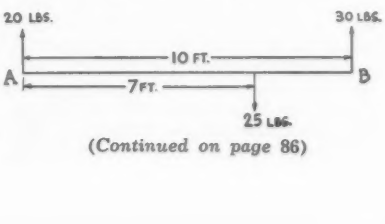
21-24. To which one place—Africa, Alaska, Australia, India, South America—are each of the following places closest: Madagascar, Sumatra, New Zealand, Aleutian Islands?

25. Tallest mountain in the U. S.

PHYSICS.

The book suggested here is Milliken and Gale's "Practical Physics." The high school grad had a little trouble here; getting barely 70 per cent. However, he stated that four weeks' study of the suggested text would help him enough to get about 80 per cent.

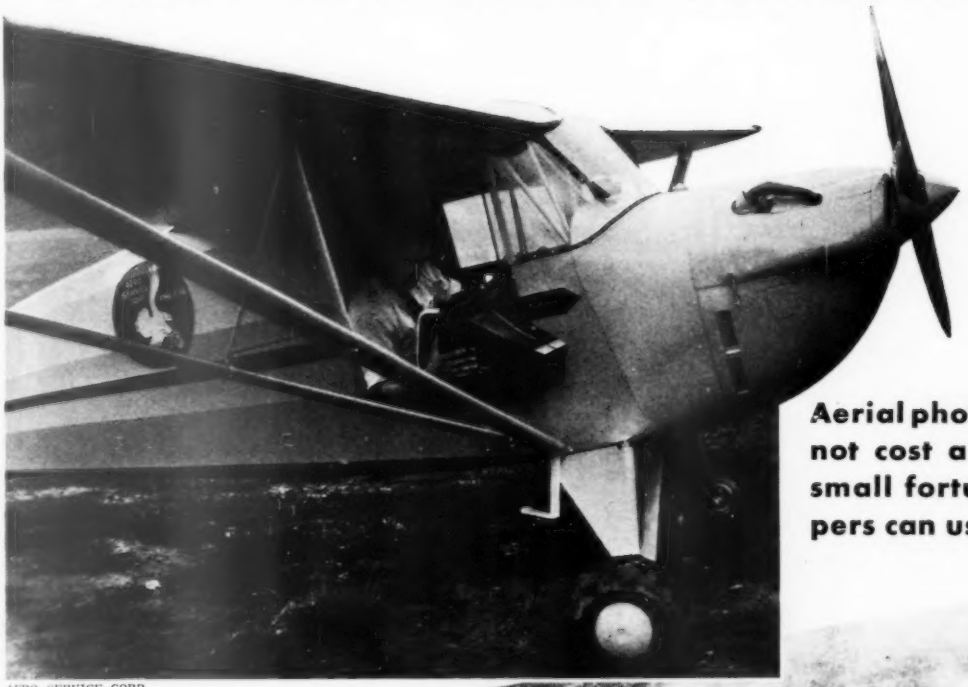
1. Three forces act on a rod AB as indicated. What is the magnitude and point of application of the resultant?



(*Continued on page* 86)

Planes for Small-Town Papers

by GEORGE R. REISS



AERO SERVICE CORP.

One progressive Philadelphia operator recently bought this Aeronca for photography

Aerial photographs need not cost a newspaper a small fortune. Many papers can use lightplanes.

George R. Reiss

YOU have read about the big powerful metropolitan newspapers which use their own expensive high-speed airplanes to rush reporters and cameramen over half of North America to the scenes of hot news stories; to speed their papers right off the presses to readers in far places; to transport their high-salaried executives swiftly and comfortably.

America's smaller city newspapers—those with circulation in a half-dozen neighboring counties, who count their readers by the thousands instead of hundreds of thousands and their editorial budgets in the hundreds instead of hundreds of thousands of dollars—can use airplanes to good advantage. Planes can be profitable, too, in covering big stories, making aerial photographs and putting on circulation stunts.

But instead of using Wacos, Stinsons, Beechcrafts, Spartans or twin-engined Lockheeds, costing $15,000 to $80,000 each, small papers will content themselves with the lightplanes—Piper *Cubs*, Aeroncas, Taylorcraft, Stinson "105's," Porterfields, or Ercoupes—costing from $1,300 to $3,500. Instead of employing professional pilots on their staffs at $500 to $700 a month, they probably will be content to let those boys on their local staffs who hold private pilot certificates do their flying jobs. Instead of ranging over half of North America, they probably will be content to stay in their own private corners of their own state.

How soon will that be? Very soon—as soon as many editors discover they can do the job at little cost; as soon as they learn what a versatile, economical and safe machine a light airplane can be, as soon as they learn how many jobs they can relay to the airplane.

Flying is my hobby and, as aviation editor of the Youngstown, O., *Vindicator* and a contributor to FLYING AND POPULAR AVIATION, I've turned that hobby to a pleasant and profitable use—a use which, in part, proves the point of how a lightplane may be made useful and profitable.

I've found many a worthy chore for the ship. It has been used for doing the jobs that could not be done without an airplane and for doing those tasks for which you never find time without that speedy and convenient transportation that is given you by a lightplane. Because it can get you there and back again twice or thrice as speedily as does an auto.

This is one of the steel mill pictures taken from author's plane for his paper.

It has been valuable for covering aviation and industrial news, floods, fires, football games, even routine events. It has been especially valuable for getting aerial pictures—those unusual air shots which fit in for a thousand and one uses and add a lot of distinction. And, incidentally, aerial pictures need no longer be prohibitively expensive or difficult to get these days. You no longer need costly camera equipment for aerial jobs under ordinary conditions. The camera any newspaper staff photographer uses for his routine jobs—and the same film, too—will do the trick after a little practice.

Just an example: our town is the heart of an important steel-producing district in eastern Ohio and western Pennsylvania, sandwiched about half way between Cleveland, O., on Lake Erie and Pittsburgh, Pa., on the Ohio River. For many years, there has been a movement on foot to induce the Government to open a 100-mile-long waterway—a $200,000,000 to $250,000,000 project—to link the busy Ohio River with the equally busy Lake Erie, tying together the world's two most important inland waterway systems. Once built, surveys by U. S. Army engineers have revealed, this waterway probably would be busier than the Panama Canal, would carry as much traffic as the Sault Ste. Marie locks. It would teem with barges loaded with iron ore, coal, coke, limestone, scrap iron and steel, oil and gasoline and finished steel.

The Youngstown district—the half-way point on the canal—naturally would boom, for it would save its huge steel plants millions of dollars yearly in freight charges.

No wonder that canal is important news—in Youngstown. Thousands of columns of news, hundreds of maps and drawings and charts and photographs have been published to show its need, its uses and its progress. So I proposed recently:

"Why not air photograph the canal route? That will give folks a better idea of what it is all about."

"How," countered one editor, "are you going to photograph a territory 100 miles long—and make it look like anything?"

"Not one picture," I explained, "but many of them—pictures of everything of importance along the route."

"Too expensive," replied the same editor, thinking of the $75-a-negative prices charged by some aerial photographers for their special jobs. But one bright sunshiny afternoon Avalon D. LeMonte, a staff photographer, and I, equipped with his camera and a plentiful supply of film, piled in a 50 h.p. *Cub* trainer and flew the length of that proposed canal route, snapping pictures as we flew.

We shot virtually everything in sight—views of heavily-laden barges on the Ohio River, terminals, all the cities, towns and villages on the route, industrial plants and electric power houses which would benefit, prominent bridges, unusual patterns formed by the rivers, railroad yards and what not—about 35 good clear pictures in all.

These pictures were a sensation. They

(*Continued on page* 98)

Fuel for Defense

by B. Orchard Lisle

Already being delivered to Air Corps bases throughout the hemisphere are huge all-weather refueling trucks like these, designed to safely carry potent 100 octane gas.

BY the time the projected air force of 50,000 planes is delivered to the Government, the American petroleum industry will be able to supply the 17,400,000 barrels (of 42 gal. each) required by the armed services. This would be more than 12 times larger than the purchases of this product made last year by the Government, but still would merely be the annual consumption estimated on a "preparedness peacetime basis."

Dr. Robert E. Wilson, oil consultant to the National Defense Advisory Commission, has asked that minimum military stocks of 1,000,000 barrels of aviation fuel be accumulated, working up to a variable maximum of 10,000,000 to 20,000,000 barrels. Present commercial stocks in the United States are reported to be in excess of 3,942,000 barrels, according to the latest figures released by the Bureau of Mines, Department of Interior, and a steady gain in aero fuel stored in this country has been indicated by the monthly statements made by the oil industry to the Bureau.

Not all of the 17,400,000 barrels of gasoline which it has been estimated will be required for the expanded air forces would be 100 octane grade—some 10 per cent would be about 73 octane, for training purposes; another 20 per cent would be around 90 octane, while the remaining 70 per cent would be of the highest quality obtainable. Slight revisions in Army and Navy specifications for 100 octane gasoline are anticipated, for such a move would enable output of this product to be increased somewhat immediately without construction of additional refining facilities, by permitting certain existing plants capable of producing 100 octane gasoline (but which does not comply fully with the other specifications) to be used for military purposes.

If an immediate expansion of productive capacity for blending agents or high octane gasoline through new refinery construction is desired, consideration must be given to the financing problem involved. There is no normal market for large quantities of 100 octane gasoline other than for the military forces and Pan American Airways—exports having been prohibited as mentioned elsewhere. The investment in added facilities to produce this product would not be profitable, therefore, unless the Government arranged to buy the output under long-term contracts or otherwise compensated those who would be called upon to make the investment.

To some extent the refinery expansion immediately required is to be reduced by accumulation of large stocks of this product by the Government. Creation of a defense supplies corporation to acquire and store high-test aviation gasoline has been announced by the Reconstruction Finance Corporation. It will be capitalized at $5,000,000, the stock to be held by the R. F. C., and will aid the Defense Commission and War and Navy Departments in the national defense program now under way. It will acquire for storage at strategic points throughout the country a substantial supply of 100 octane gasoline for the military air services, for which the R. F. C. has allotted $50,000,000.

On August 19 the Senate Appropriations Committee reported the $5,000,000 supplemental defense appropriation bill, adding among other items, $3,000,000 for storage of aviation gasoline at various locations throughout the country. Hearings revealed that it is planned to build underground tanks throughout the country to store the gasoline. Underground tanks have been agreed upon by defense officials because they would be safer from attack and not much more expensive than surface storage.

Secretary of the Navy Knox, testifying before the Committee, said that the Defense

(*Continued on page* 105)

PILOTS *Coming Up!*

From primary training at private schools, Army cadets go to Randolph for basic work.

by Virginia Withington

Army flying men are being trained by the thousands. The Air Corps already is under way with its long-range expansion plans.

AT a score and a half training fields in America's "warm weather belt" and the middle west, hundreds of Army trainers are on the line early today. They are in and out of the air until late. There is a continuous throb of engines, big and small, and an overtone of barked commands and urgent advice.

In dozens of ground schools students sit row on row in classrooms or at work stands that may be loaded with anything from machine guns and navigation instruments to powerful motors.

Back in Washington, lights burn late in the offices of the Air Corps' training and operations section, headquarters for all this activity, in the long low old War Department building. The Air Corps has begun the training of a force of 16,000 pilots and 160,000 crew and groundsmen.

They are to man the 25,000 planes—first line, reserve, utility, trainers—projected, on order or under construction for the Army, and half of which are to be delivered by the end of 1942. (A review of the plane building program appeared in FLYING AND POPULAR AVIATION for February.) Public attention has been riveted during recent months on the difficulties involved in this gigantic aircraft production effort. The Air Corps, however, faces a training and organization problem equally great, but less generally recognized.

The outlines of tomorrow's Air Corps are already visible. Its men and ships will be grouped into 22 wings. Seventeen of these—11 bombardment and six pursuit—will be based on the United States proper making up the Air Corps' striking arm, the General Headquarters Air Force. Five will be overseas—one each in Alaska, the Canal Zone, Honolulu, the Philippines and Puerto Rico. Other overseas wings will be added to garrison bases acquired last fall from Great Britain. These wings exist today in skeleton form. They will not reach full strength until the end of 1942, at the

completion of the present plane and pilot program.

A few figures measure the Army's task. Three years ago about 2,000 pilots were in uniform. The War Department is no longer giving out any figures, but it is estimated that the 1940 program has brought this figure to 5,000. Included in this are a considerable number of reserve officers recalled to active duty.

Most Army pilots trained in recent years have been granted reserve commissions only, and they retire to private life after three years of active service. The number thus commissioned so far, however, is so small that even if all available were recalled, nowhere nearly enough would be provided. The recall of all, moreover, would tend to cripple many essential services, such as the airlines. Most of the 16,000 pilots needed must thus be trained from scratch.

The Army is expanding its facilities to turn out 12,000 pilots a year instead of its previous output of about 700 to reach this goal. To do this it has had to turn over all primary training to 18 civilian schools. It has had to establish two advanced training bases: Maxwell Field, Ala., and Moffett Field, Cal., in addition to expanding its existing advanced training center, Randolph and Kelly Fields, near San Antonio, Tex. The course has been shortened from a year to 35 weeks and, most recently, to 30 weeks, eliminating all work not considered absolutely essential. Under this revised system, when the program is well under way, a class of 1,200 is to be graduated every five weeks.

The primary course at the 18 civilian schools is taught by civilian instructors who have met Army requirements. But the flying cadet is not allowed to lose sight of the fact that he is in the Army. He lives in conveniently situated barracks learning Army drill discipline and routine.

The participating commercial primary schools are: the Alabama Institute of Aeronautics, Tuscaloosa, Ala.; Allan Hancock College of Aeronautics, Santa Maria, Cal.; Dallas Aviation School and Air College, Dallas, Tex.; Cal-Aero Training Corp., Glendale, Cal.; Lincoln Airplane and Flying School, Lincoln, Neb.; Parks Air College, East St. Louis, Ill.; Ryan School of Aeronautics, San Diego, Cal.; and the Spartan School of Aeronautics, Tulsa, Okla. Nine other schools are operated as branches of all but one of these.

The primary course, as each of the other parts of the training program, lasts 10 weeks during which 60 hours, dual and solo, are accumulated. Flight training at this stage includes elementary cross-country work. A great deal of time is spent in ground school which continues, of course, all the way through the entire training program, up to the time the flying cadet receives his "wings."

At one time the well-known Stearman biplane had a near-monopoly as the Army's primary training craft. Several other types, however, now are coming into use. Notable among these are Fairchild and Ryan monoplanes. They may in time supplant the biplane entirely, although there is no indication of this now as Stearmans still are being ordered. A great many experts, particularly abroad, feel that it is preferable to start the flying cadet directly on a monoplane, since monoplanes prevail in advanced training and combat types. The monoplane, naturally, handles quite differently from a biplane. The monoplane is, for example, more heavily loaded and therefore somewhat less responsive. The Army's primary trainer grosses up to 3,500 pounds and can generally reach 150 m.p.h. It is thus not comparable to the lightplane.

Oldtimers will find it difficult to recognize Brooks, Kelly and Randolph Fields, where all Air Corps pilot training used to be given, but which are now only part of one of the three basic and advanced training centers, where the student pilot goes next. Randolph Field is headquarters of the new Gulf Training Center, which also includes a fourth and new airport at San Angelo, Tex. By March it may include a fifth, site yet unnamed, where teamwork instruction will be given bomber crews.

Maxwell Field is the headquarters of the Southeast Training Center. In addition to Maxwell, schools are being operated at Montgomery and Selma, Ala., and Valparaiso, Fla. At the last, Eglin Field, and at Selma, pursuit pilots will be given their final drill. The third great instruction command, the West Coast Training Center, is operated around Moffett Field, its headquarters, and an additional field at Stockton, Cal.

Under the original speed-up program, when the entire flying cadet course was to last 35 weeks, the basic and advanced sections were to take 10 weeks each, with an additional five-week period tacked on the end and spent in flying the latest first-line planes. The last five weeks marked the period during which the fledgling was to have specialized in one of the great divisions of military aviation—pursuit, bombardment or observation.

(*Continued on page* 84)

Pilot training already has been stepped up so rapidly that production of trainers, like the Vultee BT-13's below, is being pressed. Cadets advance from primary to basic trainers at Army training centers.

I LEARNED ABOUT FLYING FROM THAT!

NO. 25

by Herbert L. White

This flyer, a veteran test pilot, carelessly took a chance. Herewith an example of overconfidence

Herbert L. White is president of the Motion Picture Pilots' Association, those lads who do all the daring flying in motion pictures. Note that Herb, as he's known to the Hollywood gang, didn't learn his greatest lesson while performing a power dive for a film, but while piloting a lightplane over Arizona.

White was born in Omaha, Neb., June 1, 1894. During the World War he enlisted in the aviation service after being educated in San Francisco. Before learning to fly under the tutelage of Sergt. Tom Fowler in 1922, White was a famous automobile and motorcycle racer, setting a mile record for dirt tracks on a motorcycle which still stands.

He has approximately 2,500 logged hours. In the past 19 years he has barnstormed, stunted for motion pictures and been a test pilot for the Phillips Aviation Company and for Northrop. His first picture was "Air Hawks" in 1934; he has flown in about 30 since. He is president of the California Aircraft Corporation, Aeronca distributors, located at Metropolitan Airport, Van Nuys. He is married, has a daughter and lives at 7615½ Sepilveda Blvd., Van Nuys.

ONE of the primary rules of flying cross-country, particularly in the west where the terrain is constantly changing, is not in the rule book. That rule is to inquire carefully into local conditions from pilots who fly there and live there—and heed their advice carefully. I think that everyone, everywhere, should take this precaution. However, along the Pacific Coast where a pilot flies from the cold, heavy air of the ocean to light, dry air in the region of the mountains, deserts and plateaus, it's a "must." And it's a double-must if you're flying a lightplane, particularly one of low horsepower.

To eastern readers this may sound like an exaggeration, but I know of a case just 250 miles from Los Angeles where a ship was flown in at dawn and couldn't be gotten off the ground with one passenger in the middle of a hot day. I know of a rule at an airport 125 miles from Los Angeles which will not permit the attempted operation of 40-hp. craft after 10 a. m. or before 6 p. m. on hot summer days, where the elevation is only 2,300 feet.

Paste this advice to check local conditions in your hat or even on your instrument panel after I give you a flight report on a very stupid guy—myself. At the time of my experience flying cross-country from Phoenix to Winslow, I had had little time on lightplanes. I was used to a great deal of power, due to the fact that I had been a test pilot on fairly large ships and that I had been, for several years, a motion picture stunt and camera pilot. In fact, I'd just resigned as test pilot for the Phillips Aviation Company, which was then building the all-metal *Aeroneer*, to go into the business of selling light airplanes. George Byers, who was still connected with Jim Phillips as *Aeroneer* test pilot, took over my work—and then found that he had a few days of vacation. I'd decided to look over my territory and I invited him to take a jaunt with me into Arizona.

It was early in 1939. The plane was a 50 h.p. Aeronca *Chief*.

Let me give the ship a clean bill of health before I tell my story. It performed wonderfully. At the time of the Phoenix-Winslow flight it carried 17 gallons of gasoline, about 50 pounds of baggage and Byers and myself, each weighing about 180 pounds. To begin with, it definitely was overloaded.

Byers and I took off from Metropolitan Airport at Van Nuys, heading for Yuma. We landed there, gassed, went on to

(*Continued on page 93*)

Herbert White (left) is shown in front of a Northrop with Dick Grace, daredevil ace.

The heart of American superiority in aviation is in the airplane engine. Though U. S. engines excel, much new research is needed.

Engine Lab

For testing cylinder cooling, this wind tunnel's five-foot prop blows 200 m.p.h.

by WALTER C. ORR

WHAT we are doing here today may mean the difference between America's survival and subjugation. The difference lies between 1,000 h.p. engines or 1,800 h.p. engines; 340 m.p.h. or 390 m.p.h.; planes with four guns or planes with 12 guns; planes that can fly 20,000 feet up or those that can climb 30,000 feet."

With these words and figures Dr. E. P. Warner, vice-chairman of the Civil Aeronautics Board, sounded the keynote for aviation research at the civic luncheon, late in January, given by the Cleveland Chamber of Commerce as the preliminary to ground-breaking ceremonies dedicating the new $8,400,000 Government research laboratory to be built on a 200-acre section of Cleveland's Municipal Airport. Each member of the group attending the ceremonies, representing the Army Air Corps, the Navy Bureau of Aeronautics and various Government bureaus, in turn stressed the importance of research to aviation development. The consensus of informed and expert opinion is that research, particularly engine research, is vital if this country is to lead in aircraft design and development.

For 25 years the National Advisory Committee for Aeronautics — Federal agency for the coordinated conduct of research in aeronautics—quietly has done a job that is just now being given full recognition. In the early years the work was carried on with little help, few facilities, but always with much zeal. During the past few years two new research plants have been developed, one at Langley Field, Va., the second at Moffett Field, Cal. Here equipment, personnel and methods were developed leading to the establishment at Cleveland of the third plant, which will be the largest, best-equipped and most comprehensive of its kind in the world.

All activities of the new laboratory will center around engine research. Fundamentally, the aim will be to develop more efficient aircraft engines, new types and engines that can be built faster without loss of efficiency. Secondary exploration will take in fuels, lubricants, supercharging, high altitude performance and the multiple functions which enter into current demand and future requirements of engine design and performance.

An indication of the scope of the activities in project for the new laboratory were disclosed in a statement by Dr. Vannevar Bush, chairman of the National Advisory Committee for Aeronautics, appearing before the appropriations committee of the House of Representatives. In his outline of the laboratory's functions Dr. Bush said:

"We want to investigate very carefully the non-orthodox types of airplane engines—that is, engine such as those which are not within the beaten path. In the coming years engine development will proceed at a slow pace from one design to the next. An engine company cannot afford to step way out on a radical design and see what is in it. It may cost $1,250,000 to develop a new engine. It takes years. In order to find out whether there is anything in the more radical types of engines, we need a lot of fundamental basic knowledge in regard to them.

"At the new Cleveland laboratory we propose to lay the groundwork for new engine advances and that is a very broad job that will bring in whatever we get through a great deal of fundamental thermodynamics study."

In detail, the complete laboratory plant will consist of seven units. Of these, five are functional and two service and administrative. Dr. George W. Lewis, director of aeronautical research for the N. A. C. A., analyzes the various units and respective costs as follows:

1. Power plant laboratory and shops
   Building $1,700,000
   Equipment 2,250,000
2. Power plant wind tunnel.... 3,100,000
3. Engine torque stands
   Building 150,000
   Equipment 50,000
4. Fuels, lubricants and instrument lab.

Building	250,000
Equipment	150,000
5. Hangar	
Building	180,000
Equipment	20,000
6. Administration building	
Building	180,000
Equipment	70,000
7. Miscellaneous: Heating, power, water supply, roads, fences, tanks	300,000

The new laboratory will be the heart of the nation's aviation industry because of its engine development work, since, in the words of Dr. Lewis: "the engine is the very heart of the airplane. The magnitude of America's investment in the aircraft program during the next few years necessitates greatly increased concentration on research in order to give the country assurance of the maximum possible return upon its investment and assurance that this nation will more than keep pace with other nations in aircraft and aircraft engine development."

There was nothing haphazard in the selection of Cleveland as the site for the new laboratory. The committee had had presented to it, and had carefully scrutinized 71 sites in 61 communities. The Cleveland Chamber of Commerce, however, presented the following inventory of advantages which were not matched elsewhere:

Cleveland had its great municipal airport and a 200 acre site in connection with the port, which the city was able to provide at a $1 per acre rate. It is the true center of the aviation parts industry, with nearly an even 100 firms actively producing. It has an extremely favorable location in relation to established engine production—and adequate rail, highway, water and air transportation facilities. Its inland location, remote from seaboard vulnerability, also was considered.

Obvious necessity is behind the centralizing at Cleveland of all engine research. The ever-mounting cry for speed, both for our own needs and from abroad, and the elimination of the admittedly serious bottleneck of engine scarcity, have served to expedite this planning and decision. Construction will be under forced draft all the way and, when completed, the scope of activities will be broad and inclusive but so synchronized that every problem in engine design, production fueling, lubrication, supercharging, control and operation can be undertaken on a straight line basis.

At Langley Field much effective research and testing equipment has been engineered and perfected. Some and possibly all of this equipment will be transferred to the Cleveland laboratory, or duplicated there. Other types, now under construction, will be installed.

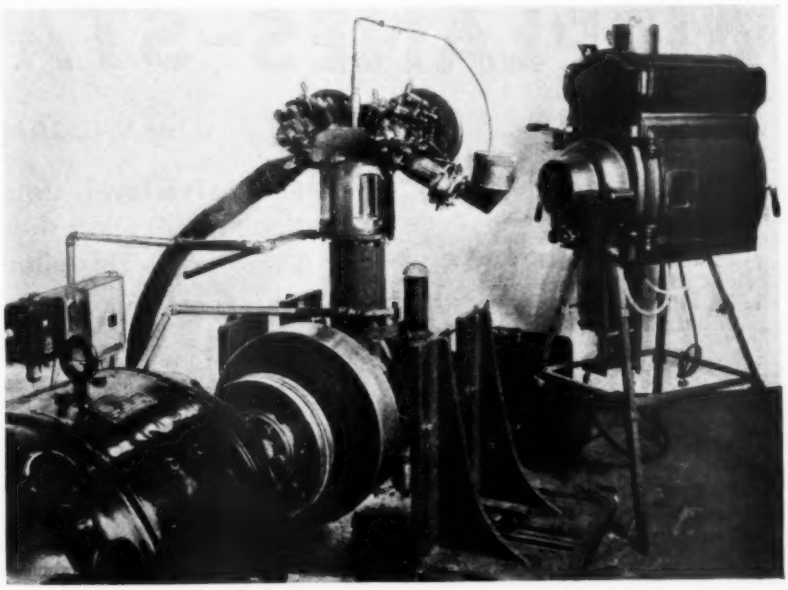
Each unit of the laboratory plant will be completely equipped and staffed to carry through on its designated functions. But facilities for whole research, from drafting board to final test, will be coordinated under central control.

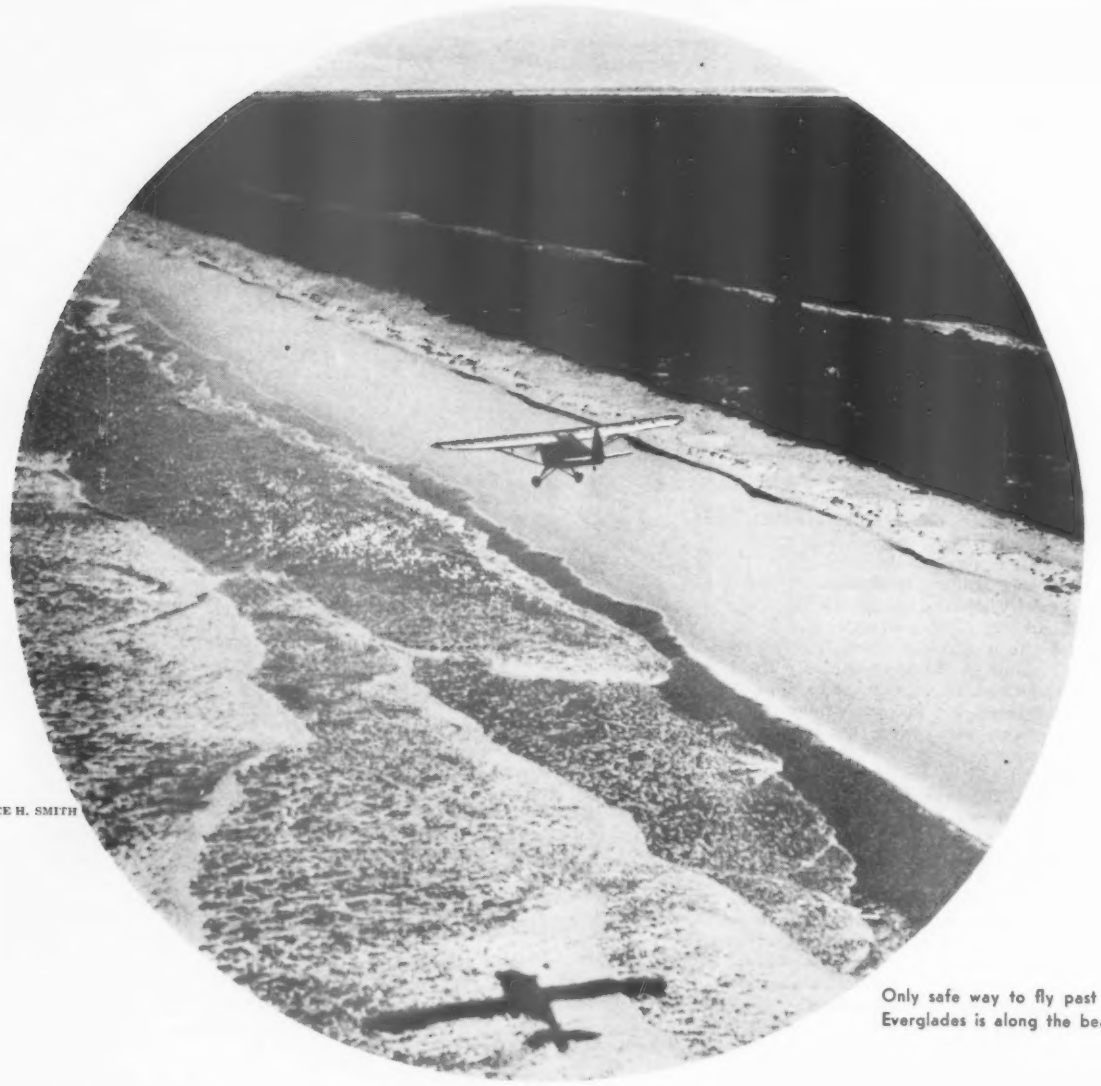
The power plant laboratory will provide for single and multicylinder investigation to improve power output and economy. Here there will be facilities

(*Continued on page 90*)

Plan of the new Cleveland laboratory (top) shows offices (1), flight research lab (2), water cooling towers (3), service building (4), wind tunnel (5), engine lab (6) and fuel-lubricant lab (7). Army and civil air officials above at ground-breaking.

Glass-cylinder engine setup in engine lab (below) is for airflow study in cylinders.





MAURICE H. SMITH

Only safe way to fly past the Everglades is along the beach.

AIRPLANES—STAY AWAY!

by WILLIAM D. STROHMEIER

Florida is a lovely state for flying, but it has one section that all pilots should shun like the plague: the Everglades. This pilot flew into them by accident.

WEST of Miami is a stretch of land 110 miles wide and 100 miles deep which is a no good place for airplanes. Strangely enough, the weather is almost always perfect over this broad expanse; there are no mountains or tricky air currents. In fact you could fly on instruments at 100 feet over this whole region and never hit anything—if your engine didn't quit. There is no spot in the whole United States where you need such an iron-bound contract with your engine as over the Everglades of southern Florida. The first impression you get of this vast expanse is, in a way, reassuring. From a few thousand feet over Miami you look west and see the flattest stretch of land imaginable. It looks like one vast landing field. But, if the sun is lowering in the west, you get a little more of an idea of what's contained in that wilderness—water, water everywhere. The sun picks up thousands of little puddles of water. None of them can be called lakes. Every other spot is soaking wet, too. As far as your eye can see west of Miami there are thousands of these little reflections from water holes. Occasionally you can see a long narrow thread of a canal and, going directly west past Miami's 36th Street Airport, is a thin line known as the Tamiami Trail. The canals are quite unique and serve a greater purpose than can be imagined. Cutting northwest from Miami is the Miami Canal which connects with Lake Okeechobee, the second largest body of water within the United States.

To understand this terrain one must go back two decades and look at Florida's geographical makeup. Florida, except for the northern half, is merely a narrow fringe of habitable ground which sepa-

rates the ocean from swamp land. Time was, not so long ago, that the water level of interior Florida was quite high and, whenever a bad hurricane hit, water was backed up into the interior with devastating results. The whole muck region of Lake Okeechobee in 1928 was inundated and thousands of lives were lost. Not even a high or dry spot for any natives and Indians caught in this catastrophe. Since then these canals have been dug, dikes been built and the situation put under generally greater control. The interior water level of Lake Okeechobee and surrounding regions was lowered 16 feet, has opened up vast, new and and fabulously rich agricultural areas. But south of Okeechobee and extending the whole width of the state, water rules and with it all the perils of tropical nature: snakes, alligators, poisonous insects, killing heat.

The tales which emanate from the Everglades bring even more forcibly to the pilot's mind the title of this article: "Airplanes—Stay Away!" Old timers conservatively estimate that there are at least a dozen ships and crews lost forever in the Everglades. There are weird and gruesome stories of forced landings from which both the pilot and airplanes have eventually been saved. One pilot forced down in the southwest section who wandered through the malaria-infested jungle for 12 days until he finally arrived on the trail, was so bitten by bugs and insects that he could hardly be recognized as a human being.

The Everglades themselves are hard to describe. There are sections of dense jungle, high palm and pine trees through which, if you fly low and foolishly enough, you can see the gnarled undergrowth living abundantly on the continuously wet swamp ground. How a person could ever walk through areas like this is a mystery. The greater part of the Everglades, however, is quite open. There are vast stretches of saw grass growing in the water. Everyhere there are pools of open water, very shallow and not good enough even for shallow-draft seaplanes Interspersed are palmetto clumps which are dark green and quite extensive in area. A small dog would have trouble navigating through this maze of growth.

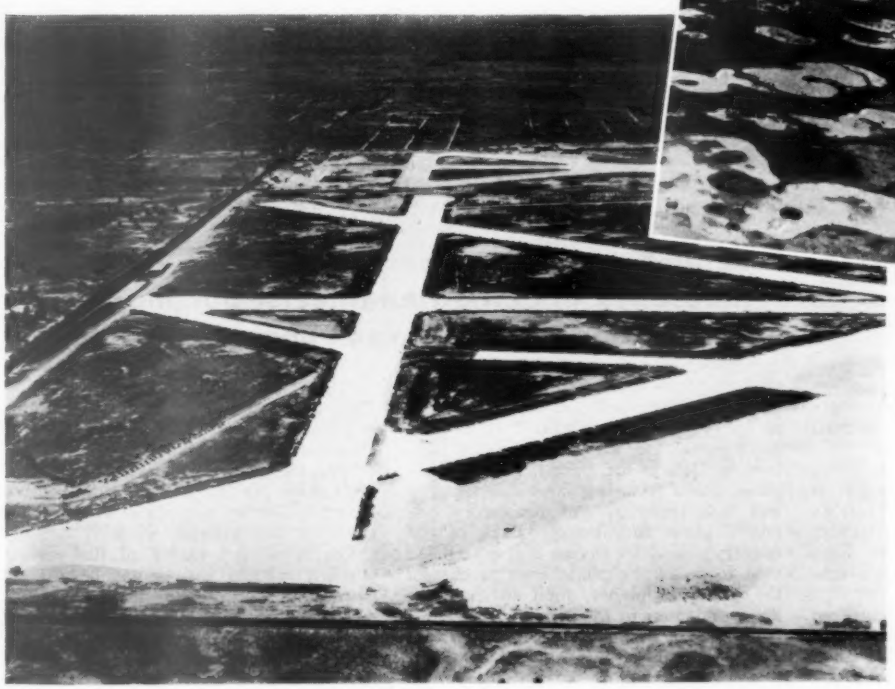
Several years ago one of the most conservative instructors in Florida disappeared while giving a student some acrobatic instruction. After months of searching both from the air and the ground no clue was ever found. Final conclusion was that the ship dove into one of these palmetto clumps and was completely enveloped in the growth. That ship, like many others, will probably never be found, as a goodly portion of the Everglades has never been bothered by the tramp of human feet. Unique phenomena of the Everglades are the grass fires which start occasionally. In this perpetually water-soaked region, a fire would seem impossible. However, the saw grass grows for several feet above the water level and, in the dry season, is easily inflammable. Many square miles of this grass will burn, the flame staying on top of the water and leaping from clump to clump.

I spent three months in Florida a number of years ago during the winter, having with me a 40 h.p. J-2 *Cub*. I had heard all these weird tales of the Everglades and had built up a terrific respect for them. Only once had I dared cross by way of the trail—and that only after PX'ing myself, following every bend of the road and saying a few silent prayers. My imagination had too good a time thinking of snakes, alligators and insects. Along about the middle of February, I was forced down in a torrential rain squall near Lake Okeechobee in a bean field. As the shower diminished, I heard above me another airplane and noted an antiquated J-5 Fairchild FC-2 flying overhead. The pilot obviously was trying to signal me and I managed finally to take off from the muddy road and follow him several miles to a narrow strip field with a hangar and shack near the lake. When I landed, I began to learn what real Florida "cracker" life was like. The pilot of the other ship, I found out, was a self-taught crop duster, had lived in this region practically all his life and had built this little airport for operating

(*Continued on page* 88)

HANS GROENHOFF

From the air the Everglades do not look as dangerous as they are. The whole area is swamp.



Almost at the foot of the Everglades is Miami's huge new airport (left). 'Glades are beyond.

VEGA AIRPLANE CO.

Aircraft plants in the New York area alone will need 6,000 new engineers by year's end.

BOTTLENECK IN BRAINS

by Bruce Campbell

Behind those high speed production lines are thousands of skilled engineers. But more are needed and schools haven't enough graduates.

AERONAUTICAL engineering skill looms today as one of the most important bottlenecks in brains which must be cracked to provide an efficient national defense for the United States and a powerful aerial offense for Great Britain. Before planes must come plans and these only the highly technically-trained aeronautical engineer can produce. To bridge the gap between plans and planes there must be still more engineers and mechanics skilled in aircraft and aircraft engine construction.

Expansion of peace-time aviation industry work depends just as strongly on aeronautical engineers, naturally, but its needs and potentialities are filed under "Future Business" while Uncle Sam looks at aviation through defense-colored glasses.

Some 20 years ago Vice President Tom Marshall made his famous remark that what this country needed was a good five-cent cigar. President Roosevelt recently re-diagnosed the country's need as "50,000 planes per year." And Congress responded with appropriated millions of dollars for aircraft, aircraft engines, plane factories, mechanic training and flight training. But you can't legislate a plane into being. Back of the country's need for planes is the need for men to make the plans, men to change the plans to planes, men to maintain them and men to fly them.

The need for aeronautical engineers was apparent in employment statistics to "engineer factories" some time ago. Prof. John Akerman, head of the aeronautical engineering department of the University of Minnesota, testifies that:

"For the past three years there have been three jobs for every graduate. We have had 100 per cent placement of every graduate into aviation work."

The placement record of the private aviation schools always has been high, since they were established largely because of the industry's need for technically trained personnel. The most emphatic statistical evidence showing demand for engineers is contained in a re-

Today there are three engineering jobs waiting for every graduate. Engineers like the Boeing men at right usually are signed up by the factories before they even finish school.

BOEING

Both technical schools and universities offer fine training to the would-be engineer. Lately, all schools have had 100% placement of aeronautical technicians with large manufacturers.

PARKS AIR COLLEGE

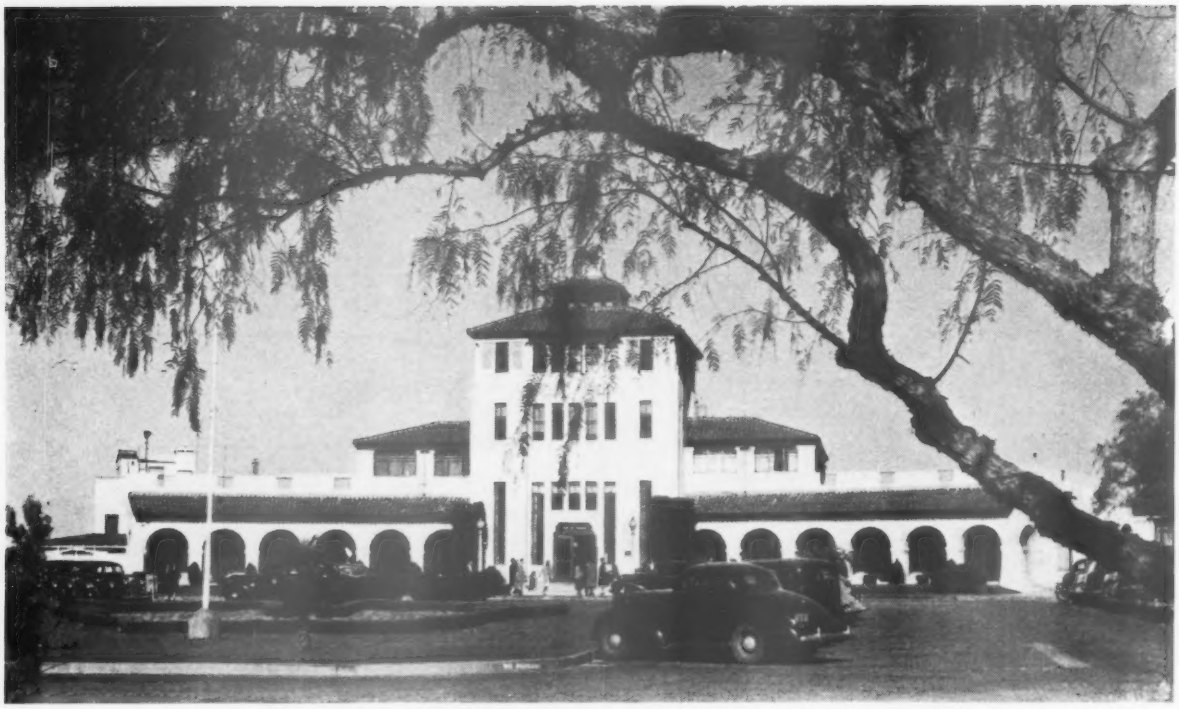
cent report by the New York Committee on Engineering Training for National Defense. Aircraft production in the New York area alone—only 21 companies employing 38,300 men—will need 6,000 new engineers within the next year, whereas a survey by the committee reveals that all the engineering schools of the nation will turn out only 12,000 (all types of engineers) this June.

Of the 12,000, a seemingly fair estimate would place the number of aeronautical engineers among them at around 2,000. The figure is derived thus: aeronautical engineering students now attending the university courses number 3,600. A fourth of that figure—since university courses take four years—is 900. It is difficult to obtain or estimate a figure for the number of aeronautical engineers to be turned out by the private schools, but the number would appear to be more than a thousand. There are 26 private schools approved by the Civil Aeronautics Board and the number of aeronautical engineers in each ranges from 400 (as in the Curtiss-Wright Technical Institute in Glendale, Cal.) to a half dozen. The rough estimate then amounts to 2,000.

In order to appreciate the need for aeronautical engineers and skilled mechanics, look at a few more statistics. Aircraft manufacturers must hire more than half a million men during the first eight months of 1941 to supplement the 233,000 already turning out planes for defense and Great Britain. (The figures were given in a statement made by Dr. Donald H. Davenport of the Bureau of Labor Statistics recently before the American Statistical Association Convention.) Davenport further estimated that 41 per cent of the men to be hired will be highly skilled workers and engineers, 46 per cent semi-skilled and the rest common laborers; that the airplane industry will employ about 350,000 and the engine and propeller industries about 120,000, with nearly 100,000 to be employed by accessories manufacturers.

The President's budget, as delivered on January 8, provides for the expenditure of $2,075,591,000 for the purchase of planes already in production and the ordering of more in the drive for ultimate acquisition of a total of 50,000 planes by both services. The Naval Bureau of Aeronautics was earmarked for $434,550,000 and the Army Air Corps for $1,641,041,000. The Navy expects to have 4,000 more planes within a year to add to its present 2,590 while the Army has 19,000 planes and equipment on order for the coming year. All figures are taken directly from the budget message.

(*Continued on page 60*)



How to Run an Airport

Union Air Terminal, fourth busiest field in U. S., now is owned by Lockheed.

by Kurt Rand

Dudley Steele, manager of Union Air Terminal, has definite ideas about making an airport attractive. Take a look at them for yourself.

IN the bustle and hustle and general expansion of the aviation industry, another job is coming of age. It opens one more professional avenue for the young man who is casting about for something to do in "this flying business" and, as private and commercial transportation increases, it is destined to have further growth. It's the kind of a job, too, that a genuine aviation enthusiast would welcome, because it gives the holder a chance to be of real service in winning and holding good will for the industry.

There are few men today who understand the operation of a leading airport. Fields are increasing in number so rapidly, passenger traffic is leaping ahead with such speed and problems are coming up with such startling suddenness that men haven't been found to cope with the situation.

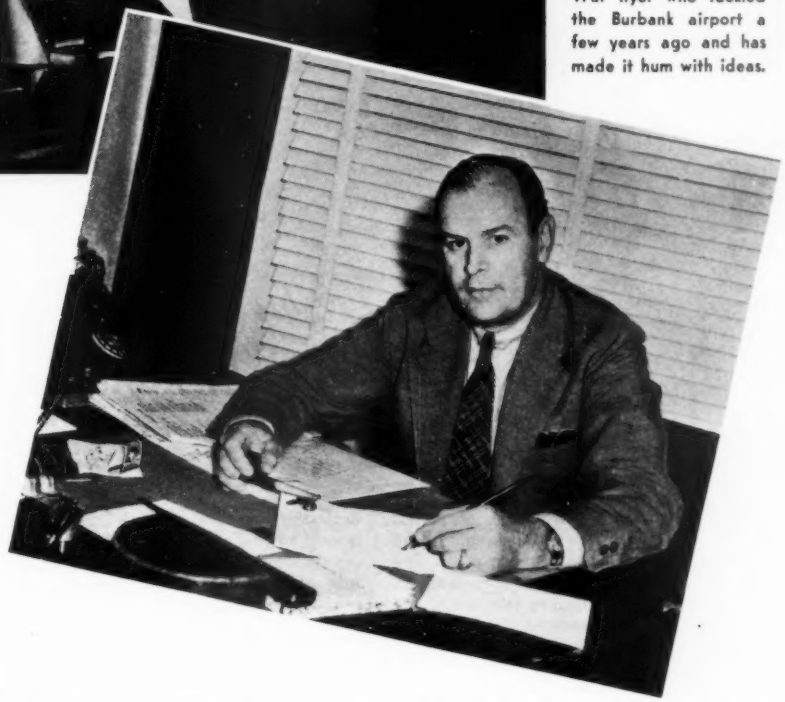
What would you do if abruptly you were notified that effective tomorrow you had such a job? In modern airport operation here are some of the problems:

Maintenance of field, lighting systems, runways and buildings; control of police force; in charge of the granting of concessions; supervisor of gardening and landscaping; supervision of control tower; handling rental of offices for various flying services; supervision of ticket office; control of operations of garage facilities, parking, restaurant and bars; regulation of the procedure in handling baggage; adjusting complaints; handling legal and insurance phases of operation, building and holding good will and in general getting more people to fly by making flying convenient.

Rating America's leading airports from a standpoint of traffic, one lists LaGuardia at New York City, Chicago Municipal Airport, Cleveland Municipal Airport and Union Air Terminal at Burbank, Cal. In each city, these airports serve as "introductions" to the areas which they serve. Of the four, none of the others can compare with the downright hospitality and friendliness, combined with efficiency that is Union Air Terminal, serving Los Angeles and Southern California. The man responsible for the conduct of the affairs for the past three years is Dudley Steele. Steele, former World War pilot, is peculiarly qualified by experience for his job. His career is a tip-off to anyone who'd like to have a job like his as they start opening up in the near future.

Union Air Terminal now is rated as the fourth busiest field in America. Lockheed which has just purchased the field from United Air Lines Transport Corp tests its *Hudsons*, its *Lodestars* and the XP-38 on it, together with other experimental ships and products; Pacific Airmotive Corporation fills a huge hangar with a repair base; Vega Airplane Company, Lockheed subsidiary, is building a plant on the field. Also operating from the field are private pilots and three flying services.

Excellent example of a place-to-get-good-food-at-an-airport is the Sky Room at Union Air Terminal. Most large airports today serve good meals.



Dudley Steele, Union's manager, is an ex-World War flyer who tackled the Burbank airport a few years ago and has made it hum with ideas.

And, to top all this, American Airlines, TWA, United Air Lines and Western Air express now operate 62 flights per day, maintain maintenance and repair bases in some cases and soon Catalina Airlines will use it as a base. Add Army and Navy planes, visiting ships from all parts of the world, an average of 5,000 visitors a day and you have something.

Your approach to the field from the air is one you'll never forget. Your pilot lets down over the rugged Sierra Madres. You see the long macadam runways, the administration building with its Spanish architecture, the hangars, the shining planes at six gates, and the next thing you know you're on the ground. A few minutes later you find yourself bundled into a limousine, baggage stowed and you are on your way into Los Angeles, some 15 miles away.

It's "streamlined," that business of landing and leaving. You've gone under a canopy, if the weather is wet; you've found an immaculate waiting room, any accommodations which you might have wanted from a pack of cigarettes to a six course dinner. Going out is even smoother. A uniformed attendant takes your bag. You never see it again until you've reached your destination. One Steele innovation is calling attention to a large garage. If you've driven out to the field alone, you may leave your car, knowing that it will be taken care of safely until you return. There's no fuss and bustle, no loss of time and baggage.

"The main thought in the mind of an airport manager," Steele says, "is to sell air transportation. Someone has talked the potential passenger into flying. At this point, the airport manager picks up. He must make all ground facilities as near perfect as possible. After that it is up to the airlines.

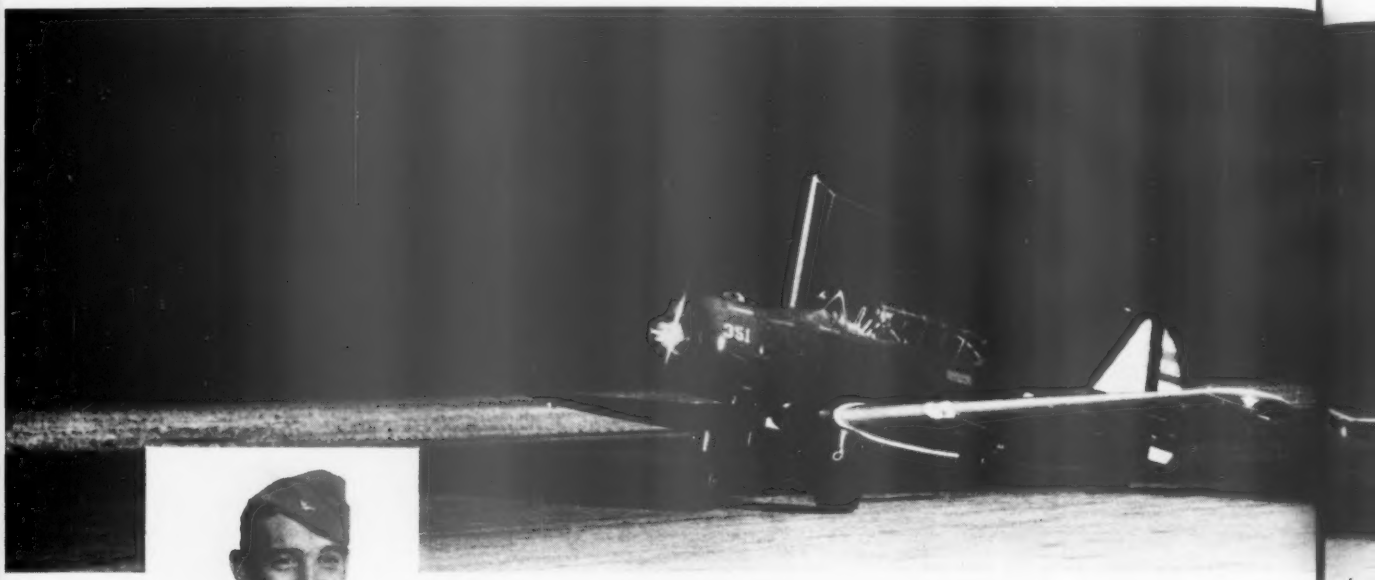
"It must be remembered always that airports and air transportation must be merchandised. Attendants must be neat and clean and well uniformed. Every building must be spick and span. Questions must be answered intelligently. And not only must air transport be sold but the airport must itself be put on a paying basis."

If you are thinking of being an airport manager, that must be one of your objectives—to make the airport pay. The airlines will want space for storage and operations; private pilots will want a good hangar; all plane operators will want gasoline. There'll be rental receipts all right. But what of public convenience?

First of all, you have to make the passenger like your "shop." What do you sell in addition to service? Plenty. For instance, there's one airport in the east which is beside a highway over which pass 60,000 automobiles a day. This airport, believe it or not, has no service station to supply *automobiles* with gasoline. If there was one, what does that suggest to the motorist? A chance to eat, now that he's stopped. And where does he want to eat? Well, at Union Air Terminal, he eats overlooking the runways, where he can see everything from Boeing *Stratoliners* to 40 h.p. trainers take off and land. At most of the major airports, so-called cafes are so constructed and placed that runways are not visible to patrons.

(*Continued on page 76*)

NIGHT SOLO



by Lieut.
Frank R. Pancake

I COULD never put my finger on it, but to me there has always been something intangibly fascinating about night flying. It has its own peculiar sort of thrill. I remember how I used to run out of the house at night, whenever there was an audible drone of a motor, to search the sky with a sort of awed wonder until I had picked out the moving stars from the myriads of stationary ones; the red and green and yellow lights that moved across the heavens as though a part of that upper world rather than my own.

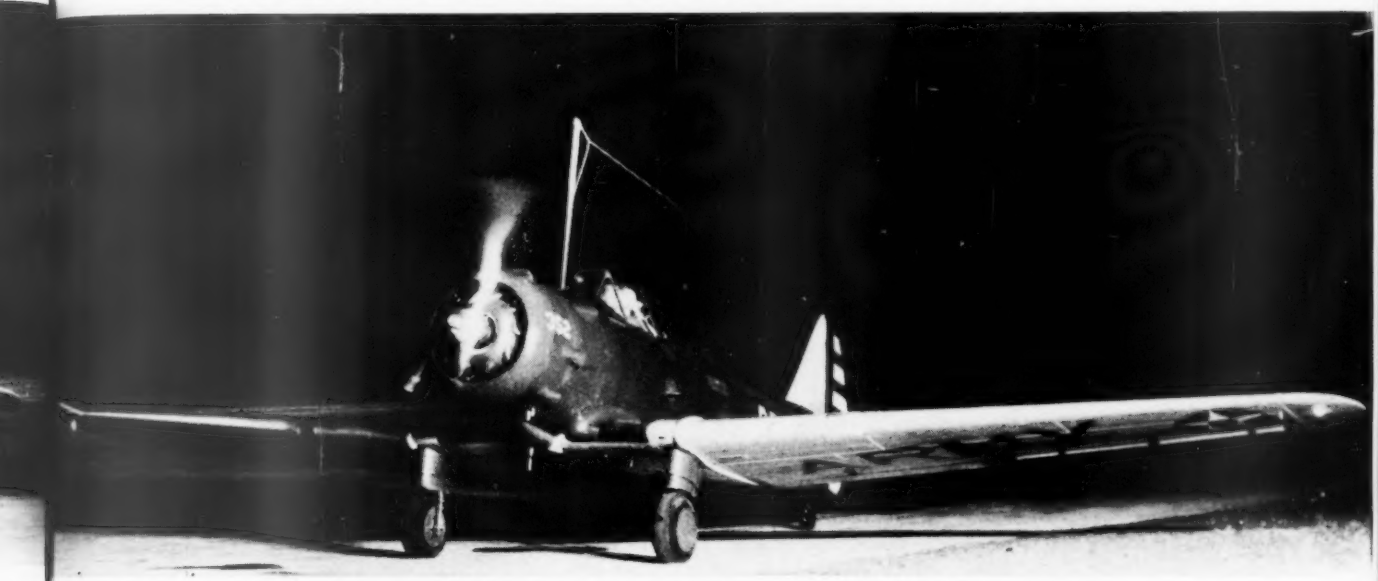
Three months at Randolph Field have shown me that those same lights are very much a part of my world, but that mysterious fascination has only increased. Night after night I sat in my barracks room and listened to the muffled roar of motors as the members of my upper class went through their night training flights. I watched them drop silently out of the sky to come gently to rest in the glow of the field lights. I watched them land in the eerie half-light of a swinging parachute flare dropped from 2,000 feet. I watched all this and I wondered. Will I ever be able to do all that?

Well, the time for watching and wondering is over. Tonight I find out. For here I am, climbing into the cockpit of my basic trainer preparing to roar off into the darkness. My instructor in the rear cockpit gives a few words of caution, explains in general what we are going to do and how, taxies out into the glare of the floodlights and opens the throttle. The red and green boundary lights begin to move, the long hangar line becomes a blurred wall of black, and then the whole suddenly drops away and we are alone in the night. We turn immediately to our zone and await the signal to come in for a landing. I glance back at the field. It has already taken on the proportions of a miniature toy town outlined in red and green. The control tower gives us a call and we turn back toward that all too diminutive circle of lights. Swiftly we glide into the field and my instructor sets the ship down with the easy grace of a wild duck dropping to the surface of a quiet lagoon. "See how it goes?" he says over the interphone; "now you take her around." Around we go again and this time I come gliding in only to find that the ground has suddenly sneaked up and given my landing gear an uppercut that sends us skyward like an antelope that had bedded down for the night on a clump of cactus. I push the stick forward, then ease back and with a very agreeable thump the ship drops to the ground. Two more times we go around and come in, each time finding me making a more earnest attempt to get down without spreading both the plane and its occupants all over the field. Either I'm doing a lot better or a lot worse for my instructor decides it's time he made his adieux. "Don't forget, if your motor quits, pull your flares; if you don't see a good field and you can't get back to this one—well, that's what you've got that 'chute for." I reply with what I hope sounds like a matter-of-fact "Yes, sir" while I'm thinking that probably the only thing that will make me bail out is for the darn thing to catch fire and smoke me out.

For a moment I stare forlornly at the chute-laden figure retreating to the safety of the stage house, idling wondering meanwhile just why I left a perfectly good home back in Virginny.

"Well, 272, are you going to sit there all night" comes roaring in my ears and I realize—having by this time regained my senses if not my composure—that the unseen Ruler of Flying Creatures, the Omnipotent Being in the control tower, is becoming just a bit impatient at my delay. I grab my microphone. It won't reach. I bend over and give it a yank. This time it comes free. So does the frequency switch. Very slowly and carefully I repeat into the microphone my much-rehearsed radio procedure.

Night flying always has been a fascinating phase of aviation to the pilot. This Army flyer describes his reaction to his first night flight while a cadet at Randolph Field.



The night flight described by the author in this article was made in a North American BT-9 trainer.

"272 to control tower, go ahead." No answer. I try again. Still no answer. Something's wrong. I begin to look around the cockpit. Ah—that damn switch. I flip it over to the correct position.

"—and maybe you'll let someone else use that ship if you've decided to spend the night on the ground." I begin to get the idea that I'm more or less incurring the wrath of His Highness. "Sir, 272 requests permission to take off and go to Zone 2, go ahead." Resignedly, from out of the darkness, "And how much gas have you got, 272?" I tell him. "Okay, taxi out and take off. Tower off."

By now I'm really in the well known storm. Nevertheless I manage to fight my way back into the blackness of the upper air. Turning to head for my zone, I am overtaken by that relentless voice, "Come in for a landing Zone 2." I reach for the mike to acknowledge the message. No mike. I take a look at the hook where the gadget is supposed to dangle. Empty. Oh boy, the circus has started. Making a fantastic effort to keep the plane on an even keel, I begin fishing around in the shadowy depths, following the cord till at last I discover my voice distributor dangling nonchalantly between my knees. I grab it and say, "Zone 2, okay, off."

"You needn't shout, Zone 2, we can hear you okay." In my effort to hear my own voice above the noise of the motor, I've probably cracked several window panes and two or three dispositions in the control tower. Making my way downwind for the approach to the field, I'm beginning to collect myself—then that voice again. "Open your throttle about another quarter of an inch and you'll be wide open, 272." This just a bit sarcastically. I glance down. Sure enough the "gun" is still full on. I have forgotten to throttle back to cruising speed after the take-off. To the boys on the ground it probably sounds like the Burlington *Zephyr* on a down-hill grade and 30 minutes behind schedule. Chagrined, I throttle back. A moment now to look around. I glance up at the stars above sparkling weirdly through the glass canopy, then down at the twinkling lights below. It looks just about as far to one as to the other.

But now it's high time to think about this business of getting down without relying solely on Dr. Newton's Law of Gravitation. Where are those floodlights? Oh yeah . . . yeah, there they are. Looks more like a member of the ground crew

(*Continued on page 92*)

Before taking off for night flying, these Army cadets must carefully check and rehearse the traffic procedure they will use in approaching or leaving Randolph Field.

QUICK SHIFT

by
RALPH F. KREISER

Hastily erected after its arrival at Kern County Airport is the squadron's barracks (top). Directly above are the 79th's Vultee BT-13 basic trainers just after completing their flight to Bakersfield.

To transfer an entire Army flying school 265 miles in one day is a feat worth looking into. The 79th School Squadron recently chalked up this record.

KERN COUNTY and the U. S. Army Air Corps are making history again. Army training planes are roaring over Bakersfield, Cal., day and night as 130 cadets of the 79th School Squadron rush through their basic training in the first Army air training school ever moved from one spot to another.

The move was historic. It was the first time an Army training school literally was picked up and moved from its stated base and established in another location hundreds of miles away. Tactical units are moved every day; pursuit, bombardment and supply units are shuttled about the country as the need arises; fields are set up and squadrons based there every few months. But for the first time in the history of the Army Air Corps, an entire air school was transferred with speed and dispatch.

The incident was replete with drama. For weeks, rain and fog had held the Vultee BT-13 training planes on the ground at Moffett Field, center of the west coast Army pilot training operations. As war thunder rolled in Europe and national defense preparations doubled here at home, the cry arose. "More pilots! More pilots!" Pressure increased on Moffett Field as planes rolled off the assembly lines in factories and civilian air schools sent primary students into the Air Corps for more training.

Randolph Field was overcrowded. New Air Corps bases were established in the United States and possessions; an expanded Army Air Corps training program demanded that there be no delay in the teaching of these cadets and their advancement to the seats of the fast-flying war birds being given the service. High command shouted for pilots.

But the weather at Moffett Field ignored the shout of high command and laughed at instructors and cadets who daily went out to the hangars and cursed the pea-soup fog and rain which kept them grounded. Experienced flyers could sail through this weather, airlines flew through it—but it definitely was no weather in which to teach cadets to handle a heavy, fast, powerful, military airplane.

Finally, on January 9 at 2 p.m., Colonel E. B. Lyon, commanding officer at Moffett, called the members of his staff into his office for a conference. Outside the rain rattled on the runways and the cadets stared through streaked windows in the barracks.

"Gentlemen," he said, "General Harms (commanding the west coast Air Corps training center) has issued orders that "B" Stage will temporarily operate at Bakersfield. As you all are aware, seasonal rains here at Moffett Field have rendered both the main airdrome and

(*Continued on page* 82)

Want a Job?

by HURD BARRETT

WE'VE HAD so many letters from men and women who wanted to get into airline work, and—we are ashamed to confess this—we knew so disgracefully little about the workings of a modern American air transport line, that we went out the other day to talk to Charles T. Wrightson, who is the Los Angeles terminal station manager for United Air Lines. Mr. Wrightson is installed in a pleasant office at the great Union Air Terminal, which is located at Burbank, a suburb of Los Angeles.

The terminal—its waiting room doesn't look too different from that of a big railroad station—was crowded. Four major airlines operate out of Union—United, American, Western Air Express, and TWA—and there is hardly a quarter hour passes but what a trip of one of the airlines takes off or lands on one of the spoke-like runways.

As we admitted before, we know very little of airline operation procedure. Our line is manufacturing, but the marvel of what was happening brought home to us the organization, thought and care that must be being exercised to make these trips possible. The trips that were and had been running so smoothly despite a spell of flying weather that can only be classed as "lousy."

So we were more than a little humble when we went into Mr. Wrightson's office and asked him to explain to us how an airline operations department worked and to tell us what jobs an airline operations department offered and what qualifications a man hoping to make aviation his life work would have to have to be able to fill one of them.

Mr. Wrightson said that he could give us most of the picture on his company's operations department, but that many of the positions and procedures on other airlines did not entirely conform to United's organization chart. We said that we understood that there were always differences in detail between all business firms in the same line; and that such differences were caused by the personalities of the executives who were responsible for their operation. We also ventured to suggest that all airlines were confronted with essentially the same problems; and that the setup at United—even though the titles and jurisdictions of the jobs might not be absolutely identical with those used by American, TWA, or any of the other airlines—would probably conform in general to those of any major operators. In other words, that the jobs he outlined to me would have to be filled, no matter *whose* airline we were dealing with and no matter what title you gave the men who held them. He agreed—albeit with reservations, because any man who is proud of the way he does his work and of the company he works for. He always believes, even though he may not say so, that *his* company is the best damn' outfit that ever came down the pike. This is the feeling that is called in French *esprit de corps*—and it's darned lucky that most of us have it. And just in passing, may be make the point that if you really feel the same way about your *job*, the way to the top will be a hundred times easier for you.

* * *

A dispatcher on an airline has an extremely responsible position and is paid accordingly. His duties include the dispatching of all outgoing trips, receiving the incoming ones and the working out of the detailed flight plans required by the CAB, with the captain-pilot of each trip before the take-off. A dispatcher must know meteorology, radio, operations and the thousand other things that go into running an airline with a thoroughness that is almost uncanny. Besides which, he must have a certificate of competency issued by the CAB. Putting aside the mechanical flying skill required of an airline pilot, we'd say that the examination for such a certificate is as hard as that which must be passed to secure a hard-to-get transport pilot's rating.

To become a senior dispatcher a man must pass through the following stages:

1. Meteorologist.
2. Dispatch clerk.
3. Dispatcher; and he finally becomes a:
4. Senior (or directing) dispatcher for a terminal station. A terminal station being a field like New York, Chicago, Brownsville, Tex., or any place where a trip ends.

United and many of the other major airlines prefer engineering graduates as candidates for the starting position of meteorologists. Most of them do, however, take men who have worked up through the company in other operational jobs. Most companies in any line of business do this. Some employees distinguish themselves by personality, leadership and ability to learn by doing; or by an aptitude for self-study that sends them past their fellows in spite of educational handicaps. This isn't Horatio Alger stuff. Other men can work like the devil and not get to first base. It just happens to be one of the cruel facts of life that certain people are better adapted to certain types of employment than others; and get ahead where other people who have more theoretical knowledge—and may even be more intelligent and industrious — fall behind them. There are a number of employment research organizations in this country working on the unfitting of round pegs from square holes and on the task of finding out where they belong. We believe this should be a Governmental function; and that it will be in the distant and more ideal future. Just because a man's father was a farmer, a pharmacist or a junk peddler is no reason why he should not be a million times happier and more efficient as a policeman or lawyer.

But to get back to this dispatching job. The candidate for such work should be a graduate engineer, as we've said. It isn't necessary that he be an aeronautical engineer—although this would be an advantage, of course. He may be a civil, chemical, electrical or mining engineer. In any case he will have the engineering training that the airlines are looking for. Which means that his mind will be trained to think the way that experience has taught the airlines is most effective in the work they will eventually expect him to do. They will also expect him to have completed a course in aeronautical meteorology—a course that is given, usually, only by specialized technical universities in the category of M.I.T. and Cal. Tech; and in those state universities that specialize in aeronautics. United (and most airlines) has a company course in meteorology. This course usually will be given intensively to those men who have come up through the company, or who were taken in from the outside without special meteorological training.

These meteorologists go to work at flight operations offices or terminal station dispatcher's offices and break in on a dispatcher's job. They do much of the detail weather mapping work and help the dispatcher on flight plans with regard to meteorology. They also do clerical work.

* * *

The dispatch clerk—the next step up—can be considered to be an assistant dispatcher who has none of an assistant dispatcher's authority. His job is to do all the detail work that a dispatcher has to think about. He writes up clearance forms and flight plans from the data given him by the pilot and the dispatcher. He collects Government airway information as to weather, the condition of fields and other flight data. He lists trips and crew personnel. He writes up any extra sections required for the trip due to heavier than normal traffic. He answers the phone. He is, in fact, an apprentice dispatcher. And when he is qualified and there is a vacancy, he becomes a dispatcher.

A dispatcher, as we said before, must have secured a CAB dispatcher's certificate of competency, as well as a third-class radio telephone operator's license. He is responsible with the flight crews of the aircraft for getting all ships in and out of the air on their regular schedules. In the event that there is an irregular termination, due to bad weather, he is responsible for determining the place where the ship will sit down as well as for the ground transportation to take the passengers, cargo and mail to their destinations. The senior dispatcher, chosen for service and competency from among the dispatchers, is a station dispatcher's boss. He is responsible for the work of all dispatchers in his station. We might add that United Air Lines is not a "ground determined" line. The ground force advises and cooperates with flight personnel until the ship is in the air. After that, the pilot is the captain of his own ship and the ground crew's every effort is to help him in his every problem. The dispatcher does not, however, have jurisdiction over him. The pilot is, in other words, the boss, until he gets back on the ground.

* * *

So much for dispatchers. We cannot give the wage scales in these various categories, but we determined upon judicious inquiry that all technical airline jobs are paid in relation to their importance and to the skill and knowledge required to fill them. *We would say, off hand, that the basic starting wages for airline personnel are somewhat lower than those in the manufacturing industry; while those that are paid to skilled personnel are higher.*

We now come to the communications division. Principally, the function of communications is to provide radio service—two-way telephone, direction, weather, etc.,—between the plane in the air and the various company ground flight control stations. Communications do, however, include telephone, telegraph and telemeter (a type of leased wire

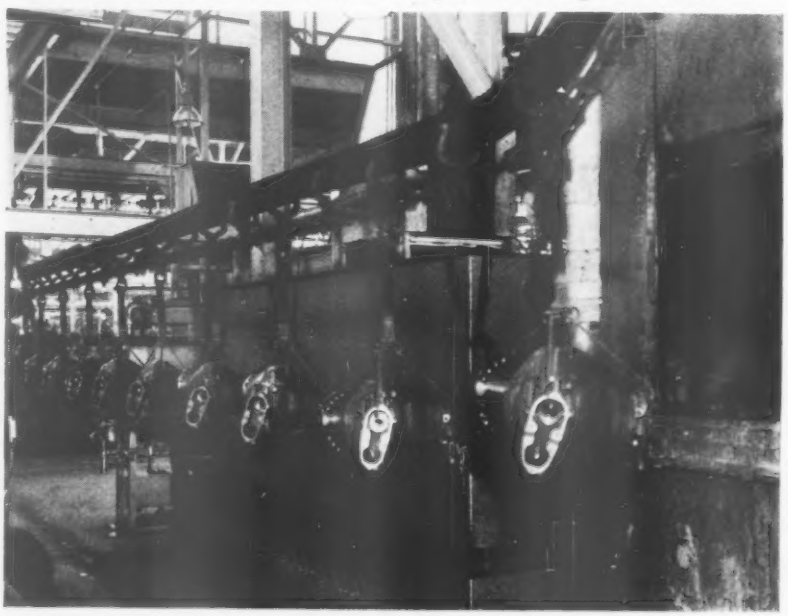
(*Continued on page 97*)

Flying Family

A RARITY in the private flying world is the Fitzgerald family of Troy Grove, Ill. So far as is known, they are the first five brothers ever to solo all on the same day. The Fitzgeralds above are, left to right, Joseph, 25; William, 18; Vincent, 20; Francis, 26; and Pat, 21. With them, at right, is their instructor, William Vogel of LaSalle, Ill. Three of the brothers are continuing aviation merely as a hobby, while Francis wants to be an airline mechanic. Pat was going to become a commercial pilot; all of them, meanwhile, planned to buy their own plane.

Engines, Mass Production

TO speed up national defense and British engine orders, the Wright Aeronautical Corp., Paterson, N. J., is using the novel conveyor-chain system, shown below, for the painting of engine cylinders. The cylinders in the photograph are entering the vapor degreaser, which removes dirt and grease which might prevent the paint from adhering properly. Incidentally, each of these cylinders has a potential output of 125 h.p.—more than the entire engine of an average automobile.



AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

The Aircraft Owners and Pilots Association, with Service Headquarters in the Transportation Building, Chicago, Ill., is a non-profit organization formed and composed of non-scheduled aircraft pilots and/or owners exclusively. *The AOPA operates with a full-time professional staff and is the largest group of civilian pilots in the world. This column is devoted to news of importance to AOPA members and is of a non-confidential nature.**

THE AOPA staff has just reported as this copy goes to the printers that the hotel plan long contemplated for AOPA pilots has materialized and that cards will be issued to members within the next few weeks. The service is being added at *no extra cost to members*—a sort of bonus which has been made possible due to the expansion of AOPA registration. This just goes to prove the statement which AOPA has repeatedly made—the more members we obtain the more extensive our service to pilots and plane owners will be. This year we have already added the Hertz service and the hotel service. And we will not stop here. Already the AOPA staff is busy working on other services which will be put into effect just as soon as our membership increase warrants the next step.

New York and Chicago Shows

Within the last few weeks AOPA has maintained service booths at the New York Light Airplane Show at the Grand Central Palace and the Chicago Sportsmen's and Aviation Show held at the International Amphitheater. At both shows AOPA conducted a pilots' register. In averaging the registers of both shows we have been encouraged to find that *over half of all pilots who signed the register were AOPA members!* That is a sign of real progress we think. We have known for some time that our members represent the *most active* pilots of the country. Recently we circulated a periodic membership survey which further proved our theory on this subject. During the show we were given the benefit of the advice and suggestions of many of our members and many pilots who are not as yet registered with the AOPA. Many of these suggestions were excellent and we are incorporating them into our future plans.

All in all, the booths at these two shows were worth while, for in addition to interesting many non-members in our work, it also made possible a contact with a large cross section of pilots. We did a little hangar flying with some 800 different pilots . . . which will result in some new improvements in AOPA services.

Staff Does Field Work

The AOPA staff has done an excessive amount of field work these past few weeks—much of it being necessitated by the ever growing complications of non-scheduled flying in the national defense picture. J. B. Hartranft, Jr., AOPA Executive Secretary, reports association service calls in the following states: Indiana, Ohio, New York, New Jersey, Connecticut, Pennsylvania, Maryland, Delaware, and Washington, D. C.; while Larry Lawver, AOPA Executive Assistant, has covered much of the West and Midwest on similar missions. Over thirty-five local organizations have affiliated with the AOPA as local units in recent weeks. In most cases these local units (encouraged by AOPA) have retained their local names and have merely added the words "Unit of AOPA" after their original titles.

More than half of the pilots that registered at AOPA booth at New York show (below and right), as well as Chicago, were AOPA members.

In this way we are extending AOPA's arm of influence. By helping to build strong local units we are also building nationally and giving a *single united voice to non-scheduled flying* which is needed particularly at this time to prevent unnecessary curtailment of non-scheduled flying.

New York Pilots Attention!

There is a bill now pending in New York State legislature (Senate No. 326) which should receive the immediate attention of every pilot who resides in the state of New York. Write now and obtain a copy of this legislation and communicate with your proper representative and *stop this measure.* This is vital to your flying interests! Highlights of the proposal are: An annual *fee* for the licensing of airports, an annual *fee* for a license to manufacture aircraft, an annual *fee* for a license to deal in aircraft, an annual *fee* for a license to conduct a school for aircraft operators (also ground schools). With all this, a duplication procedure for all pilots on the matter of aircraft and airmen's licenses, a duplicate state set-up for a "New York Airways Weather Service". Meteorological observations as now avail-

* The views and statements of opinion contained in this column are those of the Aircraft Owners and Pilots Association and not necessarily those of Flying and Popular Aviation. This column is edited by the staff of AOPA for its members and other interested parties. Special releases of a more confidential nature are additionally sent each month to all registered members.

able from Civil Aeronautics Administration Intermediate landing fields and weather stations as given over the Airway radio provide ample meteorological information for pilots operating aircraft above the State of New York.

There are still other provisions which merely duplicate Federal measures. The time to stop pork-barrel legislation is before it is passed! Get busy now. Obtain a copy of the bill, read it and then *get active*. Let your representative *know* that you oppose this measure. We are being taxed too much as it is. Introduction of this pork-barrel type of legislation by state governments will paralyze non-scheduled aviation at a time when national defense dictates a greatly encouraged non-scheduled flying program to build large reserves of pilots, aircraft, and airports—not a black-out of flying as this measure would most surely bring!

On Your Toes, Texas!

Two bills in the State of Texas should receive the attention of all Texas Flyers. The first is H.B. No. 292 introduced by James Stanford. This measure in many respects is the counterpart of the New York bill just reviewed above. As in the case of New York, it calls for the formation of a state "Aeronautics Commission." Six members are to be appointed and a full-time executive secretary. Broad powers for supervision and regulation of "all airports, landing fields, landing strips, air instruction, air marking, air beacons, and all other air navigation facilities." (Supervision of Federal property by the State of Texas we are told is an unconstitutional element).

This follows the old pork-barrel "fee" business again. In Texas they want an annual *fee* for airport licenses, an annual *fee* for air school license, etc., etc. The old ruse of crying "national defense," "emergency" and "public safety" as a mere smoke screen to cover political maneuvering seems again to be evident. If we pilots are not alert we will find non-scheduled flying bound down by State dictatorial powers too powerful to be curbed. There is no need for this duplicate legislation. It is not only a waste of public funds but a certain curtailment of non-scheduled flying activities.

The other Texas Bill is H.B. 319 introduced by Jack Love which provides for the refund of aviation fuel tax to be made *directly* and *only* to governments operating airports—NOT TO USERS.

This matter is important to all pilots who fly to or through Texas. Under present conditions they are able to have 4 cents tax per gallon refunded to them by making proper application. Under the proposed set-up these thousands of dollars will be turned over to government airports, a "general fund" or for the improvement of highways—*not for airports*, nor airway aids, nor facilities for the non-scheduled pilot and private aircraft owner. This law, coupled with the $200 annual fee proposed in H.B. 292 will do a magnificent job of putting many fixed-base operators out of business through bankruptcy.

Iowa Pilots, Act Now!

The following letter was recently sent

(*Continued on page 94*)

You Don't Say!

Unappreciated CPTP

Sirs:

. . . When I read Harvey Larson's letter in FLYING AND POPULAR AVIATION, March, 1941, it reminded me of the tramp who scolded the housewife who didn't toast the sandwich she had gone to some trouble to prepare for him.

I, too, am a CPTP graduate. We didn't have the required books for the first several weeks of our ground school, but that did not hamper us in the least. Our instructor tutored us from the single copy he had received from the CAA. We had to take a lot of notes, but I remember that portion of the course much more clearly than the part we drew directly from the Government-furnished boks. . . .

I wonder if Mr. Larson had as hard a time buying time as some of us had; or, if he bought any time at all before he entered the CPTP?

The boys in our group who had never given more than a passing thought to flying before the CPTP, were the only ones to complain about the slow replies from a much overworked CAA. In my opinion, the CPTP is a splendid program offered by a great country to a too-unappreciative public. . . .

JOHN J. SENN.

Hominy, Okla.

Slip Corrected

Sirs:

. . . On page 21 of your March issue . . . you have a picture of what you call a Nazi warplane inside an Italian bomber. Actually, it is not a German plane, but an Italian Macchi C-200. You can tell by the 840 h.p. Fiat engine, the small windshield and placement of the two 12.7 mm guns. . . . On page 58 of the February issue, you have a picture of a tri-motored troop carrier which you say has a strong resemblance to a Savoia-Marchetti design. On that fact you are right; it is a Savoia-Marchetti SM-82, developed from the civil transport SM-75, with the fuselage deepened. . . .

LADAO SATO.

Seattle, Wash.

Suggestion

Sirs:

. . . I suggest that a department in your magazine be devoted to simple flying tips for the novice. For instance, rules to try to follow during a forced landing, how to identify dangerous obstacles, how to properly "drag" a field, how to make pylon eights to find wind flow, etc. . . . Surely there are a lot of tricks one learns through experience, but these are unknown to the student and instructors don't get around to explaining much. . . .

H. P. WILLATS.

Los Angeles, Cal.

● Aside from the many separate articles dealing with flight maneuvers which have appeared frequently in FLYING AND POPULAR AVIATION, there have been 25 (including this issue) different chapters in the "I Learned About Flying From That" series, each of which should have proved valuable to Reader Willats.—Ed.

Clock Wanted

Sirs:

. . . To my knowledge, pilots are greatly interested in your advertising section. At this point I might mention an article which I have never seen advertised and for which I believe there wouid be quite an extensive market. That is a reasonably-priced clock for lightplanes, preferably one with a sweep-second hand. I have been on the lookout for such an item for some time. . . . Except for those found in expensive planes, I have never seen anything but makeshift clocks in lightplanes. Usually, these consist of automobile clocks or pocket watches tied or glued onto the plane. . . .

D. A. SHORT.

West Allis, Wis.

● Can some clock-maker help Reader Short?—Ed.

Appreciation

Sirs:

. . . I would like you to know my appreciation for the March issue of FLYING AND POPULAR AVIATION, containing "The Negro Is Flying." I have long realized the liberality shown in your periodical . . . and I feel that that article merits comment in times when national unity is stressed even to those denied their constitutional rights. . . .

MATTHEW W. PLUMMER.

Birmingham, Ala.

Now, Boys!

Sirs:

. . . I am an AOPA member and a former U.S. civilian pilot up here with several other Americans. . . . All (of us) are Leading Aircraftsmen (L.A.C.'s) on pilot and observer duties. We are interested in your articles by the ladies, Betty McKelvey and Virginia Withington, but we don't know what they look like. Why don't you include their pictures in your next issue and we will drop them a line? . . .

EARL KNOBLOCH,
Royal Canadian Air Force.

Belleville, Ont., Can.

Yanks for Canada

Sirs:

. . . Due to my age (32) I am unable to qualify as a flying cadet in the U.S. Army Air Corps. . . . Could you supply me with information relative to my prospects of enlisting in the Royal Canadian Air Force? . . . I have two years of college and, to date, have approximately 70 hours of Class 1 time. . . .

NED J. PULLEY.

Marion, Ind.

● Reader Pulley and the dozens of others who write us seeking such information should address one of the following six offices of the Clayton Knight Committee, whichever is closest to their home city: the Leamington Hotel, Oakland, Cal.; the Hollywood-Roosevelt Hotel, Hollywood, Cal.; the Baker Hotel, Dallas, Tex.; the President Hotel, Kansas City, Mo.; the

(*Continued on page 102*)

PORTERFIELD

LP-65

Porterfield Aircraft Corporation — Kansas City, Missouri

FAIRCHILD

M-62A

Fairchild Aircraft — Hagerstown, Maryland

LUSCOMBE

8A Seaplane

Luscombe Airplane Corporation — West Trenton, New Jersey

AIRCRAFT

TAYLORCRAFT

B12-65

Taylorcraft Aviation Corporation — Alliance, Ohio

FAIRCHILD — M-62A

COSTS: List price: $11,230 (net). Minimum down payment: $965.70. Annual insurance premium: not available. Operating cost per hour: not available.

PERFORMANCE: Miles per gallon of fuel: 11. Cruising speed at 75% h.p.: 120 m.p.h. Maximum speed at sea level: 135 m.p.h. Stalling speed: 50 m.p.h. Cruising range (excluding 10% fuel reserve): 440 miles. Service ceiling: 16,000 ft.

SPECIFICATIONS: A. T. C. No. 724. Type of airplane: OLM. Type of construction: cantilever. Engine: 180 h.p. Ranger 6440-C3. Fuel capacity: 45 gals. Weight empty: 1,749 lbs. Weight loaded: 2,450 lbs. Span: 36 ft. Height: 7 ft. 9 in. Length: 27 ft. 8 in. Wing area: 200 sq. ft. Wing loading: 12.25.

ACCOMMODATION: Number of seats: 2. Baggage: 50-90 lbs.

EQUIPMENT: Instruments (standard on this model): one compass, two air speed indicators, two altimeters, two fuel gauges, duplicate engine instruments.

SPECIAL FEATURES: Flaps, steerable tail wheel.

PORTERFIELD — LP-65

COSTS: List price: $1,585. Minimum down payment: $528.33. Annual insurance premium: $174.35. Operating cost per hour: $1.25.

PERFORMANCE: Miles per gallon of fuel: 22. Cruising speed: 98 m.p.h. Maximum speed at sea level: 109 m.p.h. Stalling speed: 36 m.p.h. Cruising range (excluding 10% fuel reserve): 290 miles. Service ceiling: 15,000 ft.

SPECIFICATIONS: A. T. C. No. 720. Type of airplane: CLM. Type of construction: Welded steel tube, fabric covered, spruce spars and ribs. Engine: 65 h.p. Lycoming O-145-B2 or B1. Fuel capacity: 13.5 gal. Weight empty: 675 lbs. Weight loaded: 1,200 lbs. Span: 34 ft. 9 in. Height: 7 ft. Length: 22 ft. 7-11/16 in. Wing area: 168.8 sq. ft. Wing loading: 7.1.

ACCOMMODATION: Number of seats: 2. Baggage: 40 lbs.

EQUIPMENT: Instruments (standard on this model): Airspeed, tachometer, altimeter, oil temperature, oil pressure gauge. Dual controls, dual fuel shutoff.

TAYLORCRAFT — B12-65

COSTS: List price: $2,035. Minimum down payment: $690. Annual insurance premium: 10% of list price. Operating cost per hour: Not available.

PERFORMANCE: Miles per gallon of fuel: 25 plus. Cruising speed: 95 m.p.h. Maximum speed: 105 m.p.h. Stalling speed: 35 m.p.h. Cruising range (excluding 10% fuel reserve): 375 miles. Service ceiling: 15,000 ft.

SPECIFICATIONS: A. T. C. No. 700. Type of airplane: CLM. Type of construction: Welded steel tubing. Engine: 65 h.p. Continental, Lycoming or Franklin engine. Fuel capacity: 18 gals. Weight empty: 730 lbs. Weight loaded: 1,200 lbs. Span: 36 ft. Height: 6 ft. 8 in. Length: 22 ft. Wing area: 183.5 sq. ft. Wing loading: 6.53.

ACCOMMODATION: Number of seats: 2. Baggage: 50 lbs.

EQUIPMENT: Instruments (standard on this model): Compass, air speed indicator, engine tachometer, altimeter, oil temperature gauge and oil pressure gauge, carburetor heater, glove compartments, ash tray, plastic control knobs and throttle, dual controls and dual ignition, wheel and parking brakes, full swivel tail wheel, door lock, full navigation light wiring, first aid kit, fire extinguisher, log books, seat belts and hand straps.

LUSCOMBE — 8A Seaplane

COSTS: List price: $3,195. Minimum down payment: $1,065. Annual insurance premium: $351.45. Operating cost per hour: $4.45.

PERFORMANCE: Miles per gallon of fuel: 22. Cruising speed at 75% horsepower: 95 m.p.h. Maximum speed at sea level: 102 m.p.h. Stalling speed: 40 m.p.h. Cruising range (excluding 10% fuel reserve): 315 miles. Service ceiling: 10,000 ft.

SPECIFICATIONS: A.T.C. 694. Type of airplane: CSM. Type of construction: Metal and fabric. Engine: 65 h.p. Continental A-65. Fuel capacity: 14 gals. Weight empty: 791 lbs. Weight loaded: 1,260 lbs. Span: 35 ft. Height: 8 ft. Length: 20 ft. Wing area: 140 sq. ft. Wing loading: 9 lbs. per sq. ft.

ACCOMMODATION: Number of seats: 2. Baggage: 50 lbs.

EQUIPMENT: Instruments (standard on this model): Airspeed indicator, tachometer, oil pressure and temperature gauge, altimeter.

CONTROLLABLE PROPELLERS

by RAOUL J. HOFFMAN

THE advantages of variable pitch propellers were recognized even before the first airplane took to the air. Laboratory tests indicated that, for high speed and heavily loaded airplanes, variable pitch propellers are required equipment for maximum performances. To conceive the functioning, a diagram in Section 1 shows the available efficiency for two angle settings of the blades at ¾ distance from the axis. The lower figure gives the distance and relation of the climb to equal altitudes, using a fixed and a variable pitch propeller.

A lower pitch at the start gives many advantages. It will be possible to take off with heavier loads or from smaller airports. If the blade angle can be increased to 90° (feathering) it will be possible to increase the gliding distance.

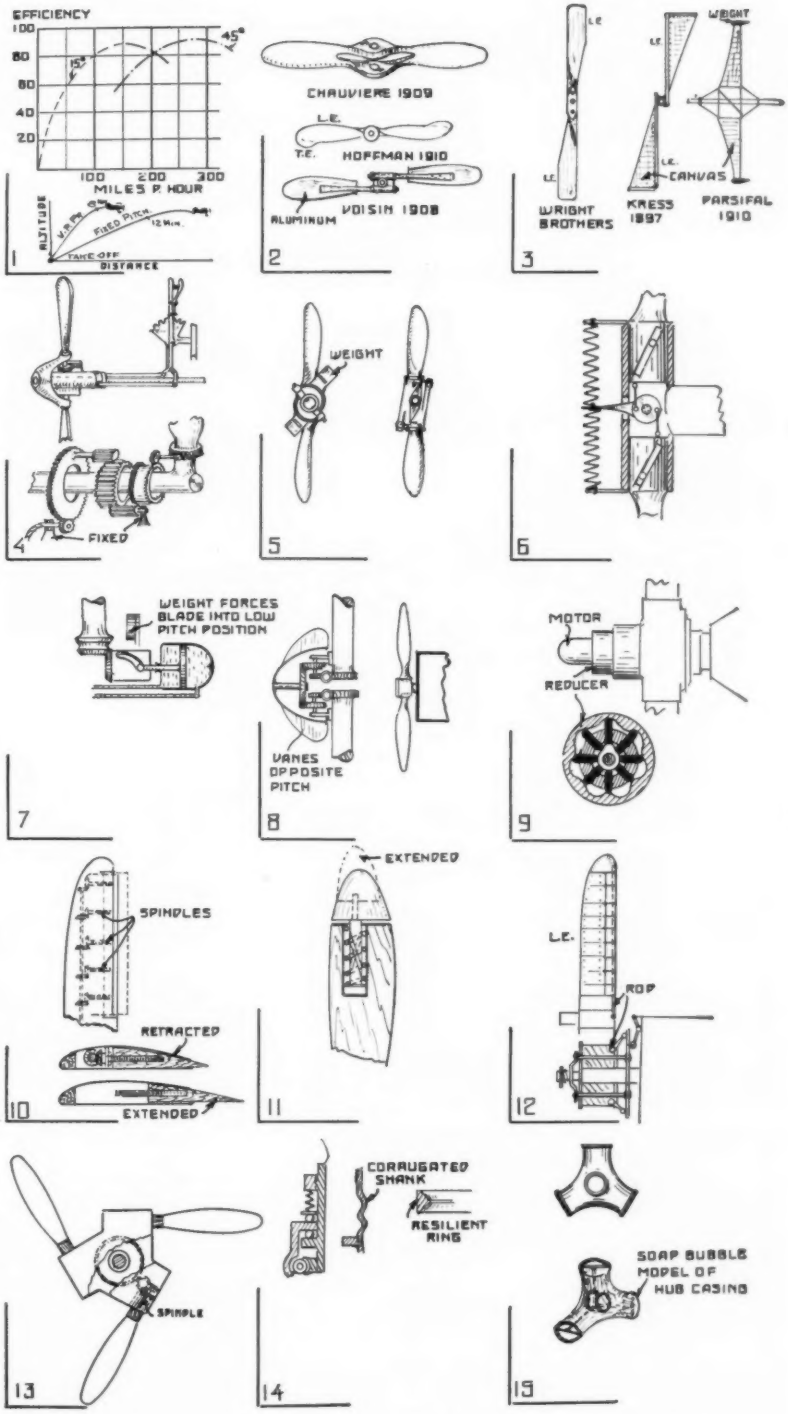
Variable pitch propellers may be grouped into three classes: adjustable, automatic and controllable. Adjustable propellers have blades that can be set only when the engine is not running. Generally metal propellers are manufactured adjustable. The settings are usually done on a special propeller table. In case of an emergency, such as a forced landing, the pilot may do his own setting by following the calibrations on the shanks given in degrees. With a lower pitch he may be able to take off from a small field which could not be cleared if the propeller blades had larger angles. Special detachable pitch meters are used for emergency adjustment.

Controllable propellers have blades that can be changed continuously by the pilot or controlled to a predetermined change during flight. There are two-position or multi-position variable pitch propellers. Feathering propellers refer to those that have a pitch setting for a minimum of drag when the propeller is not rotating. Constant speed propellers attain the same revolutions per unit time through controls operated governors.

Automatic propellers have blades that change with variation of flight conditions or power output. They are self-contained units, operated by the centrifugal force of the blades or of attached weights, or by the air force acting on the blade. Many of them are adjustable by the pilot during flight. They may be divided into selective or non-selective types. The selective designs permit adjustment during flight by the aid of a selector. The adjustment is only for certain positions.

Most of the basic ideas of variable pitch propellers were conceived years ago. However the steady, untiring outlay of time and money were required to bring them to a stage of perfection where they were safe for service. In Section 2 early attempts of variable pitch propellers designs are shown. The upper sketch illustrates a simple controllable wood propeller. The pitch it lowered by compressing the slotted hub. The middle sketch depicts an automatic propeller.

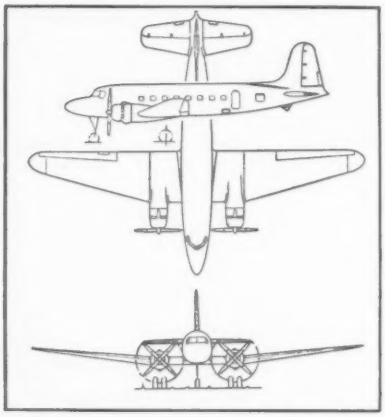
(*Continued on page 96*)



Almost every conceivable type of propeller has been tried, as these diagrams show.

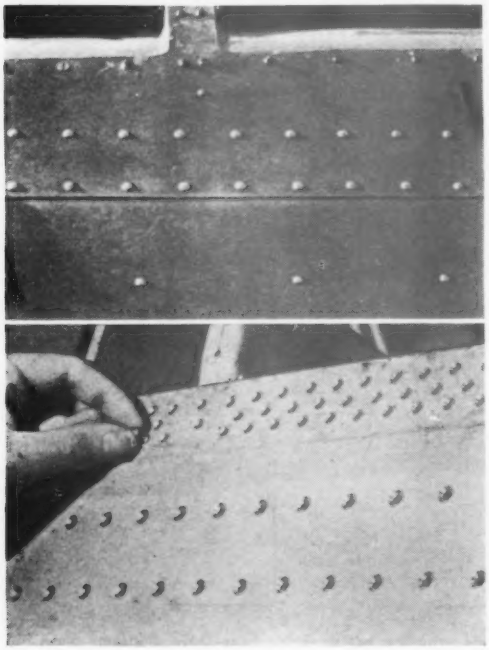
More than a dozen of these modified Consolidated PB2Y-2's now are in Navy. Note new flush gun positions.

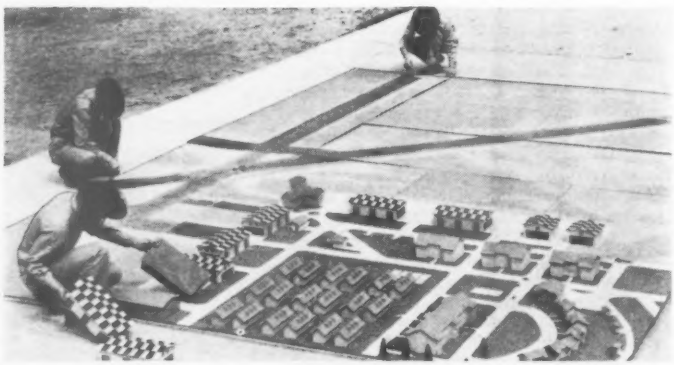
The oldest Douglas DC-2 in the world, TWA's No. 301, has been sold to the British.



New Douglas DC-6 has two 1,700 h.p. engines, tricycle gear, top speed of 274, cruising 246 and its range is 1,784 miles.

Lockheed now is using flush riveting on British and U. S. warplanes. Below is comparison between new rivets (bottom) and discarded protruding type.



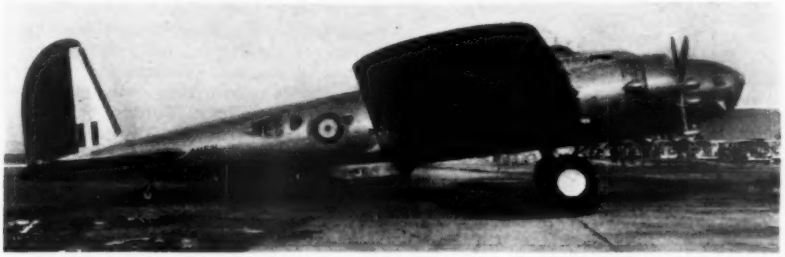


Army engineers above are experimenting with the camouflaging of air bases. Model base is at Fort Belvoir, Va. Checkered buildings are prewar system.

The colorful Aeronca below is not a Navy plane. It is owned by three fun-poking New Yorkers. Vertical bars on ship's rudder are incorrect.

First group of Douglas A-20A's for Army Air Corps is shown above. They have armor and self-sealing tanks.

HAVE YOU SEEN ?



Above is first production Boeing "Seattle" going to the R.A.F. Its four supercharged engines give it 36,000-foot ceiling. Top speed is over 300, cruising range 3,500 miles.

Optional equipment on Taylorcraft's new trainer is this tricycle landing gear.

Newest instrument for fighters is this four-gun electric Selsyn bullet counter.

These Randolph Field mechanics recently set a new record by completely changing a trainer's engine in 1 hr. and 14 min.

Now in production is this new Stinson "Voyager." It has electric starter, 90 h.p. engine, slots, flaps, hydraulic brakes, steerable tail wheel, seats for three. Top speed is 115 m.p.h., ceiling is 13,000 ft. Color scheme is Stinson yellow and bonnet blue.

Bottleneck in Brains

(*Continued from page 45*)

Rear Admiral John H. Towers, chief of the Naval Bureau of Aeronautics, testified before the house committee on Naval affairs January 7 that delivery of planes to the Navy has been slower than expected, with a shortage in aircraft engines dominating the slow-up. Three of the main factors causing the slow-up, he said, were delays in plant expansions, shortage of tools and of tool-making personnel, and *increased engineering time* on all modern aircraft development. Two things could cause increased engineering time: 1) a lack of engineers or 2) demand for more complicated engineering skill. In either case, a shortage of engineers exists.

At the conclusion of Towers' testimony, House Naval Affairs Committee Chairman Carl Vinson remarked on the obvious "limited supply of skilled labor." Authoritative confirmation of the demand for engineering skill in aviation is plentiful. A. A. Potter, dean of the school of engineering at Purdue, told the American Society of Mechanical Engineers recently that there is a "definite shortage in stress analysts, test engineers and airplane power plant designers in the airplane industry."

By comparing the plane production needs of America and the small number of aeronautical engineers who soon will be capable of going to work in responsible posts in the aviation industry, the premise that a bottleneck in brains exists appears established. Now the question presents itself—what is being done about it?

As intimated in the earlier paragraphs of this article, America derives her precious aeronautical engineers from two educational sources—state tax-supported or endowed universities and private aviation schools. Today there are in the U. S. 14 universities giving degrees in aeronautical engineering, 16 other universities offering options in the subject and one university—California Institute of Technology—giving only graduate work.

The 14 full-course schools are the University of Alabama, Catholic University of America, University of Cincinnati, University of Detroit, Georgia Tech, Louisiana State, University of Michigan, University of Minnesota, New York University, North Carolina State, Renssalaer Polytechnic, Texas A. & M., University of Washington (Seattle), and the Massachusetts Institute of Technology. The 16 giving options are University of California, Iowa State, University of Kansas, University of Maryland, Northwestern, University of Oklahoma, Oregon State, Purdue, Stanford, Yale, Boston, Harvard, Notre Dame, Brooklyn Polytechnic, Carnegie Tech and Stevens Tech.

The first aeronautical engineering department established at a university was at the University of Michigan, at Ann Arbor, in 1916. Most of the other universities, however, have been teaching the subject for only the past 10 years. The youth of the study of aerodynamics and airplane motors naturally explains for the comparatively small portion—three per cent, or 3,600—of the 105,000 engineers registered in undergraduate courses throughout the nation. Those taking mechanical engineering (the oldest form of engineering) by comparison, in 1939, numbered 24,891.

Typical of the growth of the newest science is the growth in importance and enrollment of the department at the University of Minnesota in Minneapolis. The aeronautical engineering department there was established in 1929 and in the space of 10 years jumped from last to first in number of engineering college students at Minnesota. This year 550 aeronautical engineers are enrolled, with 70 seniors due to graduate this June.

Prof. John Akerman, who has headed the department since its establishment, has noted graph curves for aviation's growth and the growth of his department. The curve representing the department's growth, says Akerman, "corresponds exactly" with curves representing increases in transport airline mileage, airway lines extensions and the volume of business done by the aviation industry, including airlines and factories.

Minnesota, like the other universities, gives a four-year course, starting to specialize the student engineer at the beginning of his sophomore year in university. The student first studies basic engineering subjects such as mathematics and physics. He takes mechanical engineering studies and practical work in laboratories, taking apart motors and re-assembling them without any parts left over. He studies civil engineering subjects such as stress of material, structures and especially analysis of stress of complicated structures. Finally, he studies the principles of aerodynamics and experiments with them.

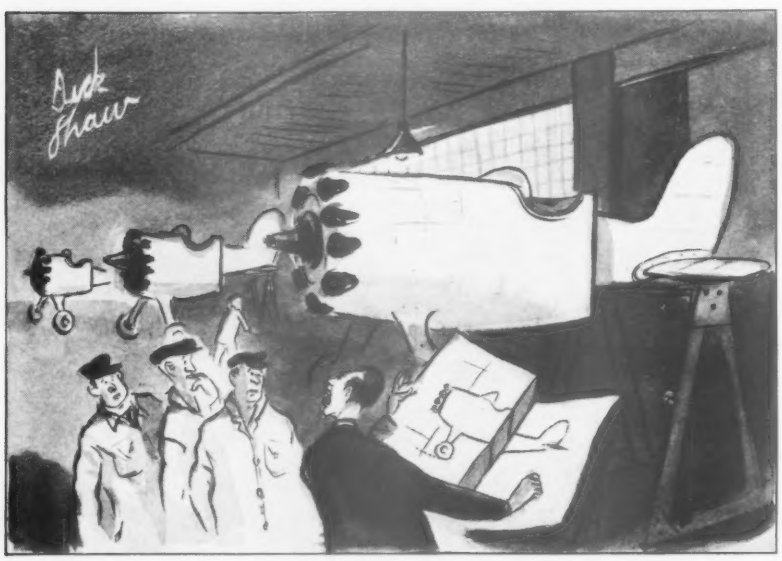
Akerman reports that despite an effort to make the work increasingly harder, enrollment in the schools increases steadily. Tuition fees at Minnesota are $35 per quarter or $105 for the academic year of fall, winter and spring quarters. The fees are a little lower than fees at most other schools at the present, but Akerman admits an increase may be necessary.

What type of American youth is the average aeronautical engineering student? He is, perforce, hard-working, purposeful and conscientious. The characteristics of industry, persistence, purposefulness and conscientiousness are forced upon him by the rigor of the courses (at any aeronautical engineering school).

"We make it plain early in the course that we aren't going to turn out any airport cowboys," says Akerman.

Approximately 50 per cent of the students work their ways through school, by summer jobs or odd jobs during the school year. Most of them work at summer jobs with air lines and at factories as they progress in school. When he graduates, as previously mentioned, the aeronautical engineer has his choice of about three different jobs. That many offers, as any collegian will verify, raises the engineer from the status of "hunting for a job" to that of "accepting a position."

The chief advantage which an aeronautical engineer derives from a four-year university course is acquisition of advanced aerodynamic theory. He also picks up knowledge in many other subjects which will aid him socially or culturally, perhaps, though it may not materially contribute to his advancement or capability in the aviation industry.



"No wonder, you dopes! You built them with a crease in the blueprints! . . ."

PIPER POINTS THE WAY TO

LOW COST PILOT TRAINING

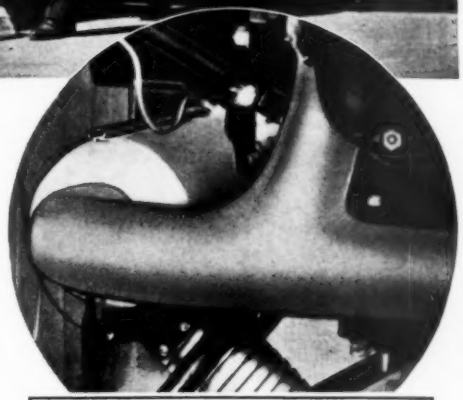
with America's Favorite Training Plane

THE PIPER CUB TRAINER

Selected above all other makes combined, by flight instructors in the Civilian Pilot Training Program, the Piper Cub has proved itself America's "standard" light-plane trainer. You who train America's pilots this year will train them at lower cost by standardizing on Piper Cubs. You save on this ship's lower price. You save on its more economical operation. You save on upkeep, for no imitation of Piper Cub's famous tandem trainer has exceeded its safety, ease of flying and forgiveness of the natural errors of student pilots. *Piper Cubs train pilots at the lowest cost of any airplane built today.* Your Piper Dealer will gladly give you complete details and a free flight demonstration.

FREE FLYING COURSE in his own plane is offered the purchaser of a new Piper. It consists of eight hours of dual flight instruction . . . take-offs, landings, taxiing and fundamental air maneuvers. At the completion of this free course the average person is ready to solo.

FREE FOLDER showing all the new Piper planes and details of the free flying course will be sent you on request or may be obtained from your Piper Dealer. If you wish a copy of the new Piper deluxe, full-color 16-page catalog it will be gladly mailed you providing you enclose 10c in stamps or coin to cover postage-handling. Piper Aircraft Corp., Dept. PA51, Lock Haven, Penna.



Quiet . . . **because every new Piper plane (except 40 h.p.)is equipped with a stainless-steel exhaust muffler which reduces engine noise to a smooth purr.**

DOWN PAYMENTS START AT

$333

EASY MONTHLY INSTALLMENTS

Tune in "Wings of Destiny" NBC Every Friday 10 P. M. (E. S. T.)
Continental "65" Piper Cub Given Away Each Week

PIPER **OUTSELLS ALL OTHER LIGHT PLANES COMBINED**

Taking Professor Akerman as a spokesman for the university-produced aeronautical engineers, let us use his statement made for FLYING AND POPULAR AVIATION as a summation of the case for the universities:

"The real backbone of the aeronautical industry will always be the graduates of the 14 schools where hard work, mental capability and scholastic achievement will be certified by a degree in aeronautical engineering."

Now consider the private aviation schools. The number of aeronautical engineers being turned out by the private schools is difficult to define, though as estimated earlier in this article, the number is probably around 1,000. It is the private schools that offer the best, probably the *only*, hope that aeronautical engineers and mechanics may be turned out in such numbers in such time as to crack the bottleneck in brains and build America's aerial defense and England's aerial offense.

The aeronautical engineering courses at the private aviation schools consume but 14 months, as compared to the four-year courses of the universities. Most schools operate their intensive, highly purposeful, 14-month courses on a basis of eight-hour days in five-day weeks. Their graduates are fully qualified, eminently practical and ready to take their places in production, planning, maintenance or repair of aircraft and aircraft engines.

Their type of course is not a short-cut in any loose sense of the word, but a practical approach to the problem of skilled personnel needed in aviation. A 13- or 14-month intensive course, as pointed out by such a spokesman as Maj. C. C. Moseley, president of the Curtiss-Wright Technical Institute, Glendale, Cal., consumes about as much time as a university student would spend in vacations from school. The study time is cut further by paring out cultural subjects and what the private schools term "non-essential" subjects or scientific courses but distantly related to the aviation industry.

The Civil Aeronautics Board has given its approval to 26 leading private aviation schools, most of which offer aeronautical engineering courses. The CAA, it must be distinguished, does not overtly list an approval of aeronautical engineering courses in the private aviation schools, since to do so would be to venture into an endorsement of a profession and probable bureaucratic trouble with the U. S. Office of Education. It does approve the schools and specifically their aircraft, aircraft engine and combine aircraft and aircraft engine courses.

The list of CAA approved schools, in alphabetical order, is: Aero Industries Technical Institute, Los Angeles; Aeronautical University, Inc., Chicago; American Aeronautical Institute, Kansas City; Billings Senior High School, Billings, Mont.; Boyer Tech, Cleveland; California Flyers Schools of Aeronautics, Los Angeles; Cleveland Flying Service, Cleveland; Curtiss-Wright Technical Institute, Glendale, Cal.; Essex County Boys Vocational School, Bloomfield, N. J.; General Airmotive Corporation, Cleveland; Casey Jones School of Aeronautics, Newark, N. J.; Lincoln Aeronautical Institute, Lincoln, Neb.; Luscombe School of Aeronautics, West Trenton, N. J.; Missouri Aviation Institute and Frye Aircraft Co., Kansas City, Mo.; National School of Aeronautics, Inc., Kansas City, Mo.; New England Aircraft School, Boston; Parks Air College, Inc., East St. Louis; Pittsburgh Institute of Aeronautics, Davosburg, Pa.; Rising Sun School of Aeronautics, Philadelphia, Pa.; Roosevelt Aviation School, Mineola, N. Y.; Sansom Technical Trade School, Inc., Hartford, Conn.; State Trade School, Putnam, Conn.; Stewart Tech, New York; Stinson School of Aviation, Inc., Long Island City, N. Y.; Swallow Airplane Co., Inc., Wichita, Kan.; and Sweeney Aviation Schools, Inc., Kansas City, Kan. The list is as of October, 1940.

"Now do you see why they designed it this way?"

Not included on the foregoing list are many well-known and highly efficient private schools, whose exclusion means nothing more than that they specialize or concentrate on courses other than the three specified by the CAA's list—aircraft, aircraft engine, and combined aircraft and aircraft engine courses. Among such outstanding schools are the Boeing School of Aeronautics in Oakland, Cal.; Parks Air College, East St. Louis, Ill.; Lewis School of Aeronautics of Lockport, Ill.; Ryan School of Aeronautics of San Diego; Spartan School of Aeronautics of Tulsa and Westwood School of Aeronautics, Inc., Los Angeles. In addition, there are many other schools concentrating only on flight training.

While the universities could be conceded a slight edge in the amount of acquired theory which supposedly would be of benefit in originating new aircraft and aircraft engine designs, the private schools train the bulk of the aeronautical engineers and practically all of the sorely needed and highly skilled mechanics in courses whose successful completion assures efficiency and capability and most of all, hard-shelled practicality.

In the eyes of George Vest, Third Region CAA Safety supervisor, the development of the private schools to their present highly efficient standard is almost miraculous.

"These schools," Vest points out, "not only had to pay their own way in the pioneering educational days, but had to — and still do — pay taxes as well. Most of them had a tough time establishing themselves. But they filled a need and now there aren't enough of them to keep pace with civilian aviation expansion and defense activity."

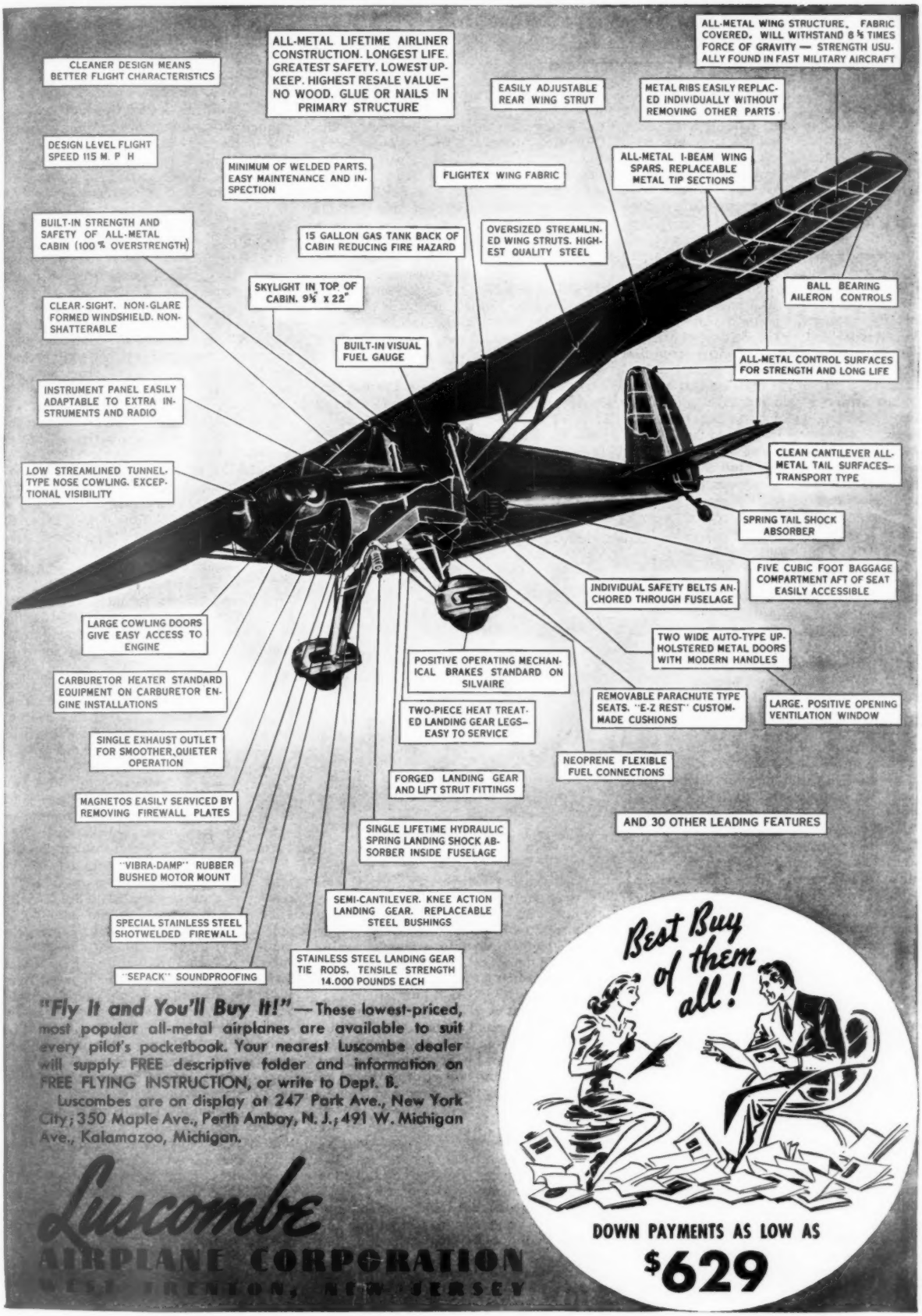
Most private schools train their students even more purposefully than the universities. Quite often, a job was awaiting only the enrollment of a student who then followed a set course in preparation for the position. Airlines and factories contracted with schools for the development of special graduates so that six months or a year before graduating the student knew what he was preparing for and could study objectively.

Now, with the heightened defense activity, the armed services have contracted with practically all of the schools for production of mechanics. The engineers, though having more of a choice in job selecting because of their rarer knowledge, are certain to go into national defense work no matter where they go since all assembly lines point that way today.

The employment situation for aeronautical engineers in regards to pay also is rosy. Reports from the schools, universities and graduates themselves indicate that the minimum starting salary for an aeronautical engineer these days is $125 a month, with the average being still higher. Of course, the better the engineer the better the job and the better the pay. Some begin at $200 and the Army Air Corps at present is crying for aeronautical engineers for whose much-needed knowledge it will give a second lieutenant's commission and salary of $225 a month. The Army Air Corps has arranged for special courses to convert other kinds of engineers into aeronautical ones. New York University and Purdue have been chosen to give such engineers a three-months' training course in aeronautical engineering fundamentals, after which the converts will take several months of maintenance work at the Army technical school at Chanute Field, Rantoul, Ill., before being commissioned second lieutenants.

Just how steady employment of aeronautical engineers may be after the present emergency ceases to exist—which is looking at least some five

(*Continued on page* 103)


ALL-METAL WING STRUCTURE. FABRIC COVERED. WILL WITHSTAND 8 ½ TIMES FORCE OF GRAVITY — STRENGTH USUALLY FOUND IN FAST MILITARY AIRCRAFT
CLEANER DESIGN MEANS BETTER FLIGHT CHARACTERISTICS
ALL-METAL LIFETIME AIRLINER CONSTRUCTION. LONGEST LIFE. GREATEST SAFETY. LOWEST UPKEEP. HIGHEST RESALE VALUE—NO WOOD. GLUE OR NAILS IN PRIMARY STRUCTURE
EASILY ADJUSTABLE REAR WING STRUT
METAL RIBS EASILY REPLACED INDIVIDUALLY WITHOUT REMOVING OTHER PARTS
DESIGN LEVEL FLIGHT SPEED 115 M. P. H
MINIMUM OF WELDED PARTS. EASY MAINTENANCE AND INSPECTION
FLIGHTEX WING FABRIC
ALL-METAL I-BEAM WING SPARS. REPLACEABLE METAL TIP SECTIONS
BUILT-IN STRENGTH AND SAFETY OF ALL-METAL CABIN (100% OVERSTRENGTH)
15 GALLON GAS TANK BACK OF CABIN REDUCING FIRE HAZARD
OVERSIZED STREAMLINED WING STRUTS. HIGHEST QUALITY STEEL
SKYLIGHT IN TOP OF CABIN. 9½" x 22"
BALL BEARING AILERON CONTROLS
CLEAR-SIGHT. NON-GLARE FORMED WINDSHIELD. NON-SHATTERABLE
BUILT-IN VISUAL FUEL GAUGE
ALL-METAL CONTROL SURFACES FOR STRENGTH AND LONG LIFE
INSTRUMENT PANEL EASILY ADAPTABLE TO EXTRA INSTRUMENTS AND RADIO
CLEAN CANTILEVER ALL-METAL TAIL SURFACES—TRANSPORT TYPE
LOW STREAMLINED TUNNEL-TYPE NOSE COWLING. EXCEPTIONAL VISIBILITY
SPRING TAIL SHOCK ABSORBER
FIVE CUBIC FOOT BAGGAGE COMPARTMENT AFT OF SEAT EASILY ACCESSIBLE
INDIVIDUAL SAFETY BELTS ANCHORED THROUGH FUSELAGE
LARGE COWLING DOORS GIVE EASY ACCESS TO ENGINE
TWO WIDE AUTO-TYPE UPHOLSTERED METAL DOORS WITH MODERN HANDLES
POSITIVE OPERATING MECHANICAL BRAKES STANDARD ON SILVAIRE
CARBURETOR HEATER STANDARD EQUIPMENT ON CARBURETOR ENGINE INSTALLATIONS
REMOVABLE PARACHUTE TYPE SEATS. "E-Z REST" CUSTOM-MADE CUSHIONS
LARGE. POSITIVE OPENING VENTILATION WINDOW
TWO-PIECE HEAT TREATED LANDING GEAR LEGS—EASY TO SERVICE
SINGLE EXHAUST OUTLET FOR SMOOTHER, QUIETER OPERATION
NEOPRENE FLEXIBLE FUEL CONNECTIONS
FORGED LANDING GEAR AND LIFT STRUT FITTINGS
MAGNETOS EASILY SERVICED BY REMOVING FIREWALL PLATES
AND 30 OTHER LEADING FEATURES
SINGLE LIFETIME HYDRAULIC SPRING LANDING SHOCK ABSORBER INSIDE FUSELAGE
"VIBRA-DAMP" RUBBER BUSHED MOTOR MOUNT
SEMI-CANTILEVER. KNEE ACTION LANDING GEAR. REPLACEABLE STEEL BUSHINGS
SPECIAL STAINLESS STEEL SHOTWELDED FIREWALL
STAINLESS STEEL LANDING GEAR TIE RODS. TENSILE STRENGTH 14,000 POUNDS EACH
"SEPACK" SOUNDPROOFING

"Fly It and You'll Buy It!" — These lowest-priced, most popular all-metal airplanes are available to suit every pilot's pocketbook. Your nearest Luscombe dealer will supply FREE descriptive folder and information on FREE FLYING INSTRUCTION, or write to Dept. B.

Luscombes are on display at 247 Park Ave., New York City; 350 Maple Ave., Perth Amboy, N. J.; 491 W. Michigan Ave., Kalamazoo, Michigan.

Luscombe
AIRPLANE CORPORATION
WEST TRENTON, NEW JERSEY

Hitler's New Warbirds

(Continued from page 15)

same horsepower, since the propulsive efficiency of a pusher propeller is a few per cent greater than that of a tractor. With the propeller behind the wing instead of ahead of it, the airflow over the wing is less turbulent. On the other hand, the pusher arrangement also involves certain disadvantages. One is the necessity for carrying the tail assembly on a pair of booms going around the propeller. The booms are frail compared to the conventional fuselage support of a tail assembly. One boom may be shot off, crippling the tail assembly and thereby making the plane uncontrollable. It is not unlikely that British pilots, as a matter of fact, will be instructed to go for the booms with their small caliber machine guns, which may be ineffective against armored vital points but destructively effective against the booms. Another disadvantage is the difficulty of bailing out safely because of those whirling blades seven feet behind the cockpit. The RAF is avoiding any similar fighter for that reason. Germany, however, can afford to lose pilots.

The *Luftwaffe's* successful development of a pusher fighter is significant in one respect: one of the main reasons the pusher plane has not been more widely used is the difficulty of cooling its engine while it is on the ground (even a liquid-cooled engine needs a cooling airstream rushing past the radiators). Perhaps Germany has solved this important problem. But how remains a secret.

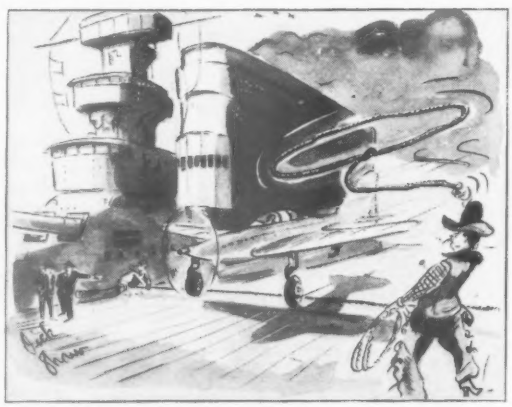
The Fw-158 also incorporates other novel features, among them an armored shield for the propeller hub. With the prop in the rear, the complicated constant-speed hub is more vulnerable than ever. In the conventional plane, it is exposed mainly to fire from the rear guns of bombers or multi-seat fighters. Here it is exposed to the more-often-encountered front-firing guns of dog fighting pursuits.

The armored spinner is not heavy, since the high speed at which it is turning means a high glancing angle for any bullet that hits. At a high angle, thinner armor is adequate. The armored spinner is not altogether new. Maj. Alexander P. de Seversky, the designer of the P-35, patented one two years ago.

The other Focke-Wulf machine is far more conventional, being in many respects a somewhat smaller, more powerful and more heavily armed version of the Messerschmitt Me-110. Its motors are 1,375 h.p. Daimler-Benz instead of 1,150 h.p. Junkers *Jumo* 211s. Its guns are heavier and more numerous: four 20 mm. cannon plus four .50 caliber machine guns, instead of two cannon and four or six rifle caliber guns. Speed also is in excess of 400 m.p.h. But again, I don't believe it is as great as the speed of the *Tornado* or *Typhoon*. I wouldn't, however, bet on it.

There has been much mention of two other Nazi fighters: the Heinkel He-113 and a new twin-engined job in which the crew lies prone for the sake of better maneuverability and improved aerodynamic qualities. The He-113 apparently is a modified He-112. The He-112 is the speedy, handsome Heinkel single-seater that never was used much because of its difficult landing and handling characteristics. The He-112 was too clean: it would have been improved by more complete slots and flaps. The He-113 may be that improved He-112. But it is probably obsolescent by this time. The unorthodox Heinkel is not believed to be in mass production yet.

Very little is known of the new four-engined Heinkel, or the He-119 for that matter either. Both the four-motored Heinkel and the *Kurier*, as well as the Junkers Ju-89 and a modification, the Ju-96, are in the same size class as our *Flying Fortress*, the Consolidated B-24, the British Short *Stirling* and the Handley-Page *Halifax*. All of the four-motored Germans but the now-obsolete Junkers, Ju-89, are known to do better than 300 miles an hour. They are also known to be exceptionally heavily armored, so much so that they are causing worry among the RAF's gun experts.



"We keep Tex aboard just in case . . ."

There is reason to believe that the German high command plans to take deliberate advantage of the fact that its bombers haven't far to go from northern France to England, by cutting down on fuel tankage and increasing armor plate to a thickness great enough to stop even .50 caliber bullets. The *Luftwaffe*, by thus cutting down on fuel, runs the risk of having to concentrate its air bases too near the French, Belgian and Dutch coasts, within easy reach of the RAF's bombers. Still, fuel load can be cut down to a great extent and armor increased without making this risk too great.

This extra-heavy armor plate program now is being carried out, according to reliable non-German and non-British reports. What it means is that only the 20 mm. cannon, among the RAF's weapons, will be effective against vital parts which ordinarily could be crippled by a few heavy machine gun slugs. The RAF's problem lies in the fact that not enough 20 mm. cannon are being turned out in England to replace the too-many .30, .303 and .50 caliber guns now in use. No 20 mm. cannon at all are yet being built in the U. S., and the number of 37 mm. cannon available is so small that even if the British wanted to use that weapon, it wouldn't make much difference this spring. The RAF wishes to avoid using the 37 mm. because no 37 mm. ammunition is made in England. The RAF's only immediate alternatives against the heavily armored Nazis are high volume of fire against tail and wing surfaces or even, in a pinch, actual ramming. Neither is a simple procedure and ramming means loss of plane every time and of the pilot a good deal of the time.

The 1941 German planes are built principally around two new series of liquid-cooled motors: the Daimler-Benz DB-603 and DB-605. The former is a 12-cylinder power plant with a somewhat larger displacement than the old standby, the DB-601 series, with which many Nazi planes have been powered in the last three years. Two models of the DB-603 have been reported, one turning up 1,375 h.p., the other 1,500. The DB-605 is a doubled DB-601, the 24 cylinders being arranged in an X. The DB-605 is thus comparable to the Rolls Royce *Vulture*, which is a doubled *Merlin*, and is distinctly different from the Napier *Sabre*, Britain's other 2,000 h.p. engine. The *Sabre* was designed from the ground up as a 2,000 h.p. motor.

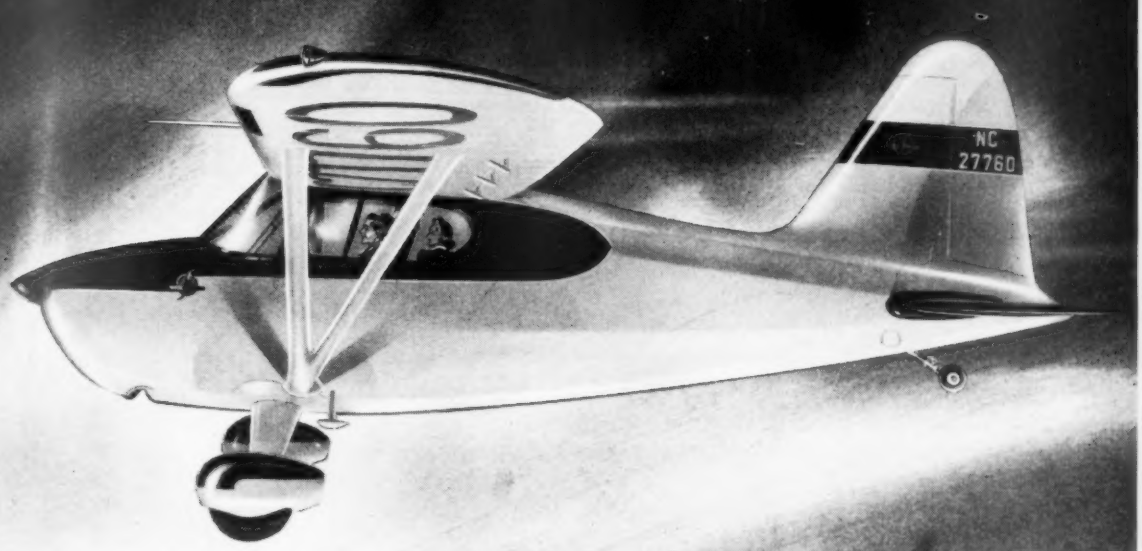
The DB-603 is going into two modifications of existing Nazi planes as well as into several of the new ones. Newly-built Dornier Do-215's and Junker Ju-88's (both are twin engined bombers) have been beefed up to take the more powerful engines. The Ju-88, with 1,500 h.p. engines, can do about 340 m.p.h. and the Do-215 about 330. Previous service types did 320 and 300 respectively. The original Ju-88 itself was fast enough to set up world records in 1939 for distance flights with service loads. Now it is even faster.

The 1941 line of *Luftwaffe* planes thus is made up for the most part of completely new designs, rounded out with improved versions of older models wherever possible.

One reason the Reich has fewer new models than the RAF is the German custom of frequently modifying basic models instead of turning out new designs each time, for example, a new motor is available. Britain has adopted this practice in the last two years and the United States is beginning to adopt it. But in neither country has it gone so far as it has in the Reich. This, of course, is one very important reason for the Nazis' superior numbers.

THE NEW 90 H.P. Stinson Voyager

LEARN WITH IT - FLY WITH IT!



A PLANE really built to "go places" with a powerful 90 h.p. engine. Whether you, your son or daughter are learning to fly or using your plane for business or pleasure, the unequalled safety record of Stinson, with millions upon millions of flight miles, is a priceless asset. Airline features such as wing slots, flaps and hydraulic brakes give safety and easy handling. Electric starter and generator, unusual vision, ground stability insured by wide landing gear and steerable tail wheel provide comfort and safety. As for economy your Voyager is better than your car. Over 20 miles to the gallon! And it is easy to buy. Write today for details.

STINSON AIRCRAFT

Stinson

Division of VULTEE AIRCRAFT, INC.

WAYNE, MICHIGAN, U. S. A.

STINSON AIRCRAFT,
Division of Vultee Aircraft, Inc., Wayne, Mich.

I am interested in buying a plane this year. Have representative call. ☐
Inclosed is $1.50 for Voyager model kit. ☐
I am interested in literature only. ☐

Address_____

Business_____

Name_____

The original Dornier Do-17 "flying pencil" bomber, for instance, appeared in six different versions before finally giving way to the Do-215. The Do-215 itself, as a matter of fact, is fundamentally a considerably altered Do-17. The new version of the Do-215, with the DB-503 engines, is the sixth Do-215 to be added to *Luftwaffe* squadrons. Three different Messerschmitt Me-109's have seen service at one time or another since the plane was first tried out in 1937 in the Spanish Civil War.

While this system makes for a higher production rate because less retooling of factory machinery is needed, it is not without its drawbacks and by no means eliminates the necessity for bringing out completely new models. After a time, further improvement of an existing model becomes impractical. So many changes must be made that you might as well do the whole job over again from the landing gear up.

The Me-109 series illustrates the point. A new modification has not been prepared this year and the Fw-158 was turned out, because the Messerschmitt's performance cannot be much increased no matter what is done to it. Originally fitted with a 640 h.p. engine and designed for one in the thousand-horsepower class, it now has one that turns up 1,150 h.p. It is too small a plane to carry a 1,500 or 2,000 h.p. motor. Furthermore, even if it could, it is doubtful that there would be any great improvement in its performance—certainly it would not be in the 400 m.p.h. class. The plane was designed for speeds of less than 350 m.p.h. At those speeds it is aerodynamically efficient. It so happens that a plane built to meet less-than-350 m.p.h. conditions is not nearly as efficient at higher speeds as one specially designed. So it is doubtful that the Me-109 could be made to go 400 m.p.h., regardless of how much power (within practical limits, of course) were put in it.

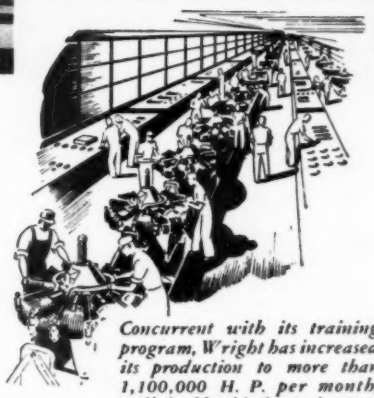
The two Focke-Wulf fighters start a new series and it is safe to say that there will be many modifications of them before the Nazis finally discard them in favor of something totally new. There also may be additional modifications of the Ju-88, as this has probably not reached the limit of its improvement. The Do-215, on the other hand, must be approaching that limit. But this system is a factor behind the immense numbers of Nazi planes.

So much for the new German and British planes. Although those familiar with them are inclined to believe the RAF's fighters are as much superior to the new Nazis as the *Hurricanes* and *Spitfires* were to the Me-109, and are certain the well-armored German bombers will give the British plenty of trouble, no one can know yet how the new ships will really line up. That cannot be known until they have been tested and retested in battle.

One thing that we do know is that the Nazi's numerical margin is still two-to-one in number of planes that can be put aloft daily. In spite of the rise in American deliveries of combat planes to England and a small increase in Britain's own production, Germany throughout the winter has turned out two planes for every one added to the RAF. Nazi production is conservatively estimated now at more than 5,000 a month. Combined British and American is perhaps 3,000. The Nazis have been able to reach this staggering production rate partly by making use of tools and factories found in the countries they have occupied, partly because they were able to slow down production of many types of armament (they have more than enough tanks, shells, bombs, etc., for example) and turn over the factory capacity and workmen thus released to producing plane parts; and partly because the continent of Europe produces plenty of aluminum ore—at the moment, more than is available to Britain and the United States.

Estimates of the number of German combat planes range between 25,000 and 36,000, with the lower figure as the more likely. In comparison, Britain probably has 10,000. (These figures do not include trainers, transports or utility ships; but only bombers, fighters and reconnaissance machines.) Operating to reduce the German margin, however, is the greater length of time British ships can spend in service between overhaul. On any one day over a period of weeks, only 40 per cent of the *Luftwaffe's* ships are available for service, whereas 75 per cent of Britain's are. The Nazis can put about 10,000 planes a day over England; the English can meet them with perhaps 4,000 or 5,000 fighters. (Bombers cannot defend England directly; only indirectly, by attacking Nazi air bases.)

THE VEGA 35, (A.T.C.) an all-metal, low-wing, primary–secondary trainer, offers numerous exclusive advantages to both students and schools.
VEGA AIRPLANE COMPANY • BURBANK, CALIFORNIA, U. S. A.



Concurrent with its training program, Wright has increased its production to more than 1,100,000 H. P. per month, will double this figure in 1941.

Skill

FOR AMERICA'S DEFENSE

Machinists in the making—quick to learn, eager . . . much of the future security of America depends on these young men who are building their success around the sound lesson of coordinated hand and mind.

The skill of Wright's thousands of "old timers," painstakingly acquired through many years of service to the aviation industry, is being transfused into young America to give greater strength and new vitality to industrial progress and to National Defense.

Wright Aeronautical Corporation, Paterson, New Jersey
A Division of Curtiss-Wright Corporation

WRIGHT
Aircraft **ENGINES**

The Germans also enjoy a heavy margin in number of pilots. Estimates on this score range between 35,000 and 42,000 as the Nazi total; perhaps 10,000 as the British. The *Luftwaffe* has lost about 4,000 pilots since the beginning of heavy air fighting over England last August. At its start, they had 25,000. New pilots are being trained at a rate of at least 2,500 a month. The minimum for the Nazis is thus now 35,000. The British training program, on the other hand, is still not functioning at top speed. Only a few hundred combat pilots have completed their courses in Canada, under the Empire air training scheme, which will not reach full pitch for a few months yet. The few thousand added to the RAF have virtually all been trained in England itself.

The war in the air this spring thus shapes itself into a picture astonishingly like that of last fall. The Germans then outnumbered the British in daily effective two to one in planes and three or four to one in pilots. They have the same margin now. The last time, British ship-for-ship superiority, however, was sufficient to stem the tide, particularly by day. Only daylight bombing is accurate enough for real military operations such as those leading up to an attempt at invasion. But whether the picture is the same, qualitatively, whether the new British planes are the masters of the Nazis individually, we do not yet know. For the new planes will dominate the show, although the older ones will undoubtedly also be called upon by both sides. We won't know the answer until the fighting is well under way and the score is available.

END

Transatlantic Bridge

(*Continued from page* 19)

about a base. Newfoundland airport near Botwood, Newfoundland, was the natural jump-off place. It had been created with joint Canadian and British funds during the three years just prior to the war. Carved out of virgin wilderness it is an enormous field with four great runways and enough paving to cover 100 miles of 20 foot highway. This field had been intended as a great commercial intermediate point for both British and American transoceanic airliners of the near future when war intervened.

Today its hangars and runways are used by military planes only. The field itself is at Gander Lake near Newfoundland's only railroad. It is 1,000 miles from Montreal, 1,200 miles from New York City. London is 2,100 miles to the east and Ireland 1,940 miles. During the winter months the entire area of the field is usable for planes with wheels, huge rolling and crushing machines being kept constantly at work flattening, smoothing and making a natural sort of cement out of the frequent heavy snowfall.

With the coming of spring the snows will melt, disclosing the runways—three of them 4,500 feet in length and 600 feet wide and one 6,500 feet in length and 1,200 feet wide. It is 540 feet above sea level, out of the fog belt that surrounds Newfoundland with some of the rottenest flying weather found anywhere at its shore lines. The airport is equipped with the latest and best radio beam, flush type landing and runway lights and full obstruction lights.

Now let us look at the problem as the first tests were made. Lockheed *Hudsons* with 1,100 h.p. Wright *Cyclones* were the ships chosen for the test. The *Hudson* has a span of 65.5 feet, a gross weight of 17,500 pounds under normal loads. Of this, 6,100 pounds is disposable load, crew, fuel, payload or ornament, bombs, etc. It carries standard tankage for 1,700 miles at 170 m.p.h. at 12,000 feet. Its maximum speed is 246 m.p.h. at 12,000 feet.

Adopting Imperial Airways' and Pan American Airways' practice, the Canadian planners demanded that a fuel reserve of at least four hours be carried. The course—Great Circle—from Newfoundland to England is 2,100 miles. Flying from west to east along the route of most of the weather the bombers could expect a 20 m.p.h. tailwind, the planners assumed. This is in keeping with practical experience of both Imperial and Pan American and also with reports of the weather as gathered by the French air observers who spent the summer of 1938 in a weather ship along this route.

This weather assistance is an important element in the program. If the 20 m.p.h. winds were on the nose, the scheme might be impossible for such air-

FINANCE YOUR CULVER CADET
the ACC way!
LOW COST FINANCING OF ALL AIRCRAFT with extra-value insurance coverages under four different ACC plans.
No matter where you live or what aircraft you buy, there is an ACC plan to fit your every requirement. Your nearest aircraft dealer can handle all details. Insurance coverages are designed under four different plans, to give the purchaser maximum coverages. Compare before you buy—you'll decide to say "I'll pay the ACC way."
IT'S MORE Fun TO FLY
Now you can buy the new Culver Cadet, with its many outstanding features, on easy terms through Aviation Credit Corporation insured financing plans. Any dealer can handle arrangements easily, quickly. All you need do is say: "I'll buy mine the ACC way." Then you'll know you receive the maximum protection at the minimum cost.
AVIATION CREDIT CORPORATION of St. Louis
ROBERTSON • MISSOURI
WRITE TODAY FOR FREE NEW BOOKLET "IT'S MORE Fun TO FLY"

Have You Ever Seen A Dream Flying?

Well, Here's One!

ANNOUNCING the new CULVER for '41

- ★ Electric Starter
- ★ Engine-Driven Generator
- ★ Extra-Size 12 Volt Battery
- ★ Rich Two-Tone Interiors
- ★ 80 Horsepower Engine
- ★ Navigation Lights
- ★ All Standard Equipment at No Extra Cost

Culver's Going Places

WITH STRATOLINER STREAMLINING
PURSUIT PERFORMANCE
SKYLINER STABILITY

LOOK AND YOU'LL FLY—FLY AND YOU'LL BUY!

FOR FULL INFORMATION WRITE DEPT. PA1, CULVER AIRCRAFT CORP., WICHITA, KANSAS

planes as the *Hudsons*, the *Venturas* and *Maryland* bombers that will be a large part of this summer's ferrying. The 20 m.p.h. assumed help boosted the average cruising speed of the *Hudsons*, at any rate, from 170 to 190 m.p.h. This speed was chosen as best for the combination of factors such as engine reliability, fuel economy and initial load. At that speed the engines were delivering 500 h.p. each, or 1,000 h.p. together. Fifteen hours of flying—the assumed 11-hour crossing with a four-hour reserve—would require 7,200 pounds of fuel and 450 pounds of oil. These can be broken down into 1,200 gallons of gasoline and 60 gallons of oil. An allowance of 700 pounds was made for crew and their life raft. All told, the disposable load of the *Hudson* was boosted to 8,350 pounds, an overload of 2,250 pounds for take-off.

Under normal conditions this airplane has a wing loading of 31 pounds. This overload increased the loading to 36 pounds—not at all an outrageous figure, inasmuch as loadings as high as 50 pounds already are being designed into various new fighter planes. Furthermore, Howard Hughes' Lockheed "14," which is the counterpart of the *Hudson*, was successfully operated on his round the world flight with a 50 pound wing loading on at least one take-off.

The *Hudson* has a roomy cockpit for pilot and co-pilot, although it is definitely a one-man airplane. That is: one man can operate it without any particular difficulty. Its controls, throttles, switches, valves, etc., are arranged so that one man can make every operation required in its operation with ease and dispatch. Nevertheless, it was thought wise to include two pilots: captain and co-pilot navigator. Also a radio operator was added to handle the key of the wireless equipment that is standard on the British models of the *Hudson*.

The Lockheed "14" has tanks for 644 gallons of gasoline and the *Hudson* has been given another 150 gallons in tanks installed at the factory. For the transatlantic crossing, however, an additional 400 gallons was required. Where was it to be stored and how was it to be stored in such a manner that no great amount of structural change was required before take-off or afterward to get the plane ready for use by an operational squadron in England? It was quite a problem.

It was until someone suggested using some of the new special rubber collapsible tanks. The Glenn Martin company was using these new rubber tanks in their latest models and the Canadians adopted this type of tank for the auxiliary in their *Hudsons*. It since has been used in the *Maryland* as an auxiliary and also in the Lockheed *Ventura*—the bomber adopted from the Lockheed *Lodestar* transport.

These auxiliaries, without going into too much detail, are arranged so that they can be piped to any of the airplane's regular tanks. As a given tank is emptied by the engines it is refilled from the auxiliary. This is done so that the auxiliary tanks can be collapsed and stored out of the way after the first five hours of any flight. The remainder is made on fuel from the plane's regular tanks.

This practice is based on the fact that the CG of the airplane is less affected by use of fuel from the regular tanks. Balance and performance both are better with the auxiliary tanks emptied as quickly as possible. As it is, the exact CG position with full load has been carefully calculated for all types now being ferried and a procedure worked out that allows the pilots to take power from the engines and watch consumption according to performance charts that they are given. During the first few hours of the flight the motors are operated at between 600 and 650 h.p., but this is gradually reduced as the load decreases. The aim is toward the maintaining of a constant air speed. As the load is burned away in the engines, the angle of attack of the wings decreases and the speed would pick up except for the reduction of throttle. At the end of the trip the motors are delivering about 400 h.p. each. It balances out so that the average of 500 h.p. is maintained. This is strictly long-range commercial transport practice.

It was expected that the flights would be made with the assistance of celestial navigation. Radio silence is imposed on all except operational flying in Canada and certainly would be imposed on bombers making the crossing as it is on surface vessels in a convoy that might be subject to air or submarine attack. But in more than 50 flights made to date, only a few times have navigators had opportunities to take shots at the stars and sun. Cloud layers at great heights or strictly rotten weather at the operational height—8,000 to 14,000 ft.—interfered. Most of the navigating is by dead reckoning, with compasses, clock, air speed and a pre-fabricated flight plan that told the pilots the time for every change in course.

Radio directional assistance is given at start and finish of flights, when homing loop antennas on the bombers can be utilized. The radio equipment aboard the planes allows them to home on military, commercial marine and standard broadcast stations. This information, however, is not of value until the stations are within distances of not more than 400 miles from the bombers. Further out, the nulls with which the bearings are taken are so broad that little help can be gained from them.

The first crossings were made secretly. Pilots were flown back to Canada and certain changes, dictated by practical experience, were made in the procedures. Then a school for the training of pilots and navigators for the work was set up in New Brunswick. Pilots were taught all the tricks to help them at take-off and were drilled in getting the utmost performance out of their engines, fuel and airplane. All pilots were required to pass special rating tests as navigators. These tests were broken down into the D.R. (dead reckoning) and Astro (celestial) branches.

There have been some accidents—at take-off in Canada, when heavily loaded airplanes got out of control. There has been one accident in England at landing after a successful trip. According to information among the pilots, there has been not one instance of a ship making a forced landing at sea during the crossing. The American engines are reported to have functioned perfectly in every instance—not at all a remarkable record inasmuch as the motors are being cruised at approximately half power and the engines used are proved power plants, refined after service for millions of hours in American commercial airliners.

About the flying. Most trips are commenced just before dusk in Newfoundland. This is done so that light for a day landing will be available in England. The elapsed time for a crossing may be anywhere from 7 to 11 hours, of which about 5½ are darkness. The darkness serves to make interception at sea virtually impossible for German long-range

FREEDMAN-BURNHAM ENGINEERING CORP.

Manufacturers of the F-B Adjustable Pitch Wood Propellers for Light Aircraft

SALUTES

CULVER AIRCRAFT CORP.

ON THEIR NEW 1941 MODEL

F-B Propellers used exclusively on the new Culver

FREEDMAN-BURNHAM ENGINEERING CORP. • 659 E. 6th St., Cincinnati, Ohio

SPARTAN Offers You 12 CAREER COURSES

for Your Success in Aviation

★

ALL ARE VITALLY IMPORTANT IN AVIATION... ALL OFFER OPPORTUNITIES FOR FINANCIAL ADVANCEMENT

The vital need for additional well trained men in every branch of aviation opens up greater career opportunities for young men of America than have ever before existed. The aviation industry is calling for men to fill good pay positions in every branch of the profession—Pilots, Mechanics, Engineers, Radio Technicians, Instrument Technicians, Meteorologists.

SPARTAN Prepares You for Any of These Aviation Careers with superior facilities that give you a head start in the field. A $475,000 expansion program has made SPARTAN one of the most modern and complete schools of its kind in equipment and training courses.

A new Instrument Technician Department with $25,000 worth of modern equipment has been added... one of the most complete repair, service and overhaul departments with facilities for taking care of 159 planes now in service has been established... a new eight-unit engine test house and other advanced training facilities are ready for you. 24 modern training planes—17 of them new, six private practice fields and skilled personalized instruction offer you unexcelled flight training. SPARTAN flight graduates are now getting immediate employment at $175 to $250 a month—and SPARTAN is receiving requests for more men to fill on-the-ground aviation jobs than they can supply.

Get all the facts. Choose your aviation career from the list of SPARTAN courses listed below, and mail the coupon now.

(Next Semester starts July 7.)

SPARTAN SCHOOL OF AERONAUTICS

DIVISION OF SPARTAN AIRCRAFT COMPANY

(14)

✓ Check Courses You Prefer

- ■ Commercial Pilot
- ■ Air Transport Pilot
- ■ Commercial Flight Instructor
- ■ Air Transport Engineering
- ■ Aeronautical Engineering
- ■ Airline Service Mechanic
- ■ Aircraft Sheet Metal
- ■ Aircraft or Engine Mechanic
- ■ Radio Maintenance & Operations
- ■ Private Pilot Course
- ■ Weather Forecasting
- ■ Instrument Technician

Spartan School of Aeronautics,
Captain Maxwell W. Balfour, Director
Address Dept. PA-51, Tulsa, Oklahoma

Send me your new Catalog describing in detail the SPARTAN courses I have checked; also stating tuition and living expenses.

Name ..... Age .....

Address .....

City ..... State .....

Previous Education .....

HERE'S HOW TO HAVE FUN WITH YOUR PLANE

IF YOU OWN any standard make of plane, small or large, there are standardized Edo Floats to fit. It takes just 2 or 3 hours to remove your landing gear and replace with Edo Floats, attached with four simple connections.

With a licensed seaplane you are *free*—free to roam wherever pleasure takes you—free of crowded airports—free of mounting traffic restrictions.

Any nearby waterfront is your home port—any lake, river or bay, your landing field. Every resort beckons you, every beach and cove where you can swim, picnic and loaf, every secluded lake where fishing and camping are best. You could fly coast-to-coast with a seaplane—and find water landing places all the way. Write Edo for complete information.

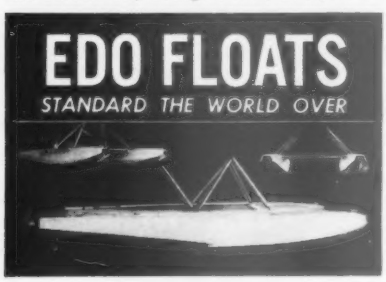
OPERATORS!

There are good profits with less competition in seaplane operation. Hundreds of new seaplane bases are available, established under the NYA-CAA Program. Plan your season now—write at once for full details.

For interesting literature, address

EDO AIRCRAFT CORPORATION

414 Second St., College Point, L. I., N. Y.



planes and hides the passage of the bombers from the prying eyes of submarines that might be looking for them to report their direction and speed back to German squadrons based in France.

It is a fact that not once has any of the single planes or squadrons making the crossing met German squadrons. This, too, is not surprising because the bombers began going to England in September at a time when the German fall air offensive over England was tapering off. Only a few ships came across during September and October. And by the time their arrival began to be frequent, the Germans were limited virtually to night raids by the RAF's fighter squadrons.

Here is a table of the types of American bombers that have been flown across to date, plus some data on performance and the overloads where these were necessary:

LOCKHEED *Ventura*. Two 1,200 S4C4 *Twin Wasp* engines. Span, 65.5 feet. Gross weight, 18,500 lbs.; overloaded gross, 20,716. Standard tankage, 644 gallons; overloaded tankage, 12,000 gallons. Range in time, 13 hours 40 minutes. Time for crossing with 20 m.p.h. tailwind, 9.5 hours. Maximum speed, 270 m.p.h. at 16,700 feet. Wing loading (overloaded condition), 37.5 pounds. Cruising speed (long range), 200 m.p.h. corrected air speed (220 with wind).

MARTIN *Maryland* (167B4). Two 1,200 S4C4 *Twin Wasp* engines. Span, 61.3 feet. Gross weight, 15,297 lbs.; overloaded gross, 18,302. Standard tankage, 600 gallons; overloaded, 1,100 gallons. Range in time, 13 hours 45 minutes. Time for crossing, 9.5 hours. Maximum speed, 316 m.p.h. at 16,000 feet. Wing loading (overloaded), 34.2 lbs. Cruising speed (long range), 200 m.p.h. corrected air speed (220 with wind).

CONSOLIDATED *Catalina* (famous U. S. Navy PBY bomber). Span, 104 feet. Gross weight, 30,500 lbs. (no overload necessary). Standard tankage, 1,100 gallons. Range in time, 30.5 hours at minimum cruising speed. Time for crossing, 13.7 hours. Maximum speed, 190 m.p.h. at 10,500 feet. Wing loading, 21.75 lbs. Cruising speed (long range), 140 m.p.h. corrected air speed (160 with wind).

By the time you read this, the Consolidated *Liberator* bomber—we know it as the B-24—will have crossed. The *Liberator's* specifications are as follows: span, 110 feet. Gross weight, 41,000 lbs. Engines, four 1,200 h.p. S3C4 *Twin Wasps*. It has a range of 3,000 miles at 230 m.p.h. and a top speed of 335 m.p.h. at 16,000 feet. Its wing loading is 39 lbs. per square foot and, for the crossing, it cruises at about 250 m.p.h., making the crossing in 8 hours 25 minutes, while carrying 12 hours' fuel.

Later this summer, the Consolidated Model 31 boat will cross. This is the equivalent of the *Liberator* except that its power is in two 18-cylinder *Duplex Cyclones* of 2,200 h.p. each for take-off. Its wing is the same as the *Liberator's*, being identical section (the new Davis airfoil described in FLYING AND POPULAR AVIATION for June, 1940,) and 110 feet span. Gross weight is 50,000 lbs., empty weight 25,000 lbs. Top speed, 285 m.p.h.; cruising speed, anything you want from 120 to 250 m.p.h., and range, almost anything you want up to 5,400 miles with normal load. Wing loading is 47 lbs.

Last but not least we'll have some Boeing *Seattles* (B-17C) going across. These are our *Flying Fortresses*. Span is 105 feet; gross weight, 45,470 lbs.; range 3,000 miles with four 1,200 h.p. G200 *Cyclone* engines. Top speed is 300 m.p.h. at 14,000 feet and the wing loading is 30 lbs.

Last, but not least, Capt. Pat Ives (who made the much-talked-about record delivery flight a couple of months back) was flying a *Ventura*. He cruised it at 200 m.p.h. corrected air speed, but caught a 70 m.p.h. tail wind that put his average speed at 270 m.p.h. for about three-quarters of the trip. He made the jump in 7 hours 48 minutes. If the Consolidated *Liberator* has any luck at all, it should better that.

END

'Speedy'

(*Continued from page* 25)

tive—whether you want fewer engines built to last or more engines which are regarded as expendable items and intended for replacement. You really can't say yet whether its an advantage to have fewer and better engines or more and cheaper ones."

(According to official German statements and Hitler himself, it is the Nazis' policy to regard both planes and pilots as items nearly as expendable as ammunition, which must be expended to attain certain objectives. As long as a plentiful reserve of standardized planes and pilots exists, the Nazis are willing to pay the price in men and mechanics to carry out missions.)

But more about McDonough. The record-breaking pilot is about five feet, eight inches tall and his physique in civvies and uniform is not outstanding or casually impressive, until he shakes hands with you. Then you feel the strength and vitality of him in his grip. His frame is muscular, particularly his forearms. His Scotch face is lean, with high cheekbones and brown eyes. His manner is affable and friendly but he is far from being talkative.

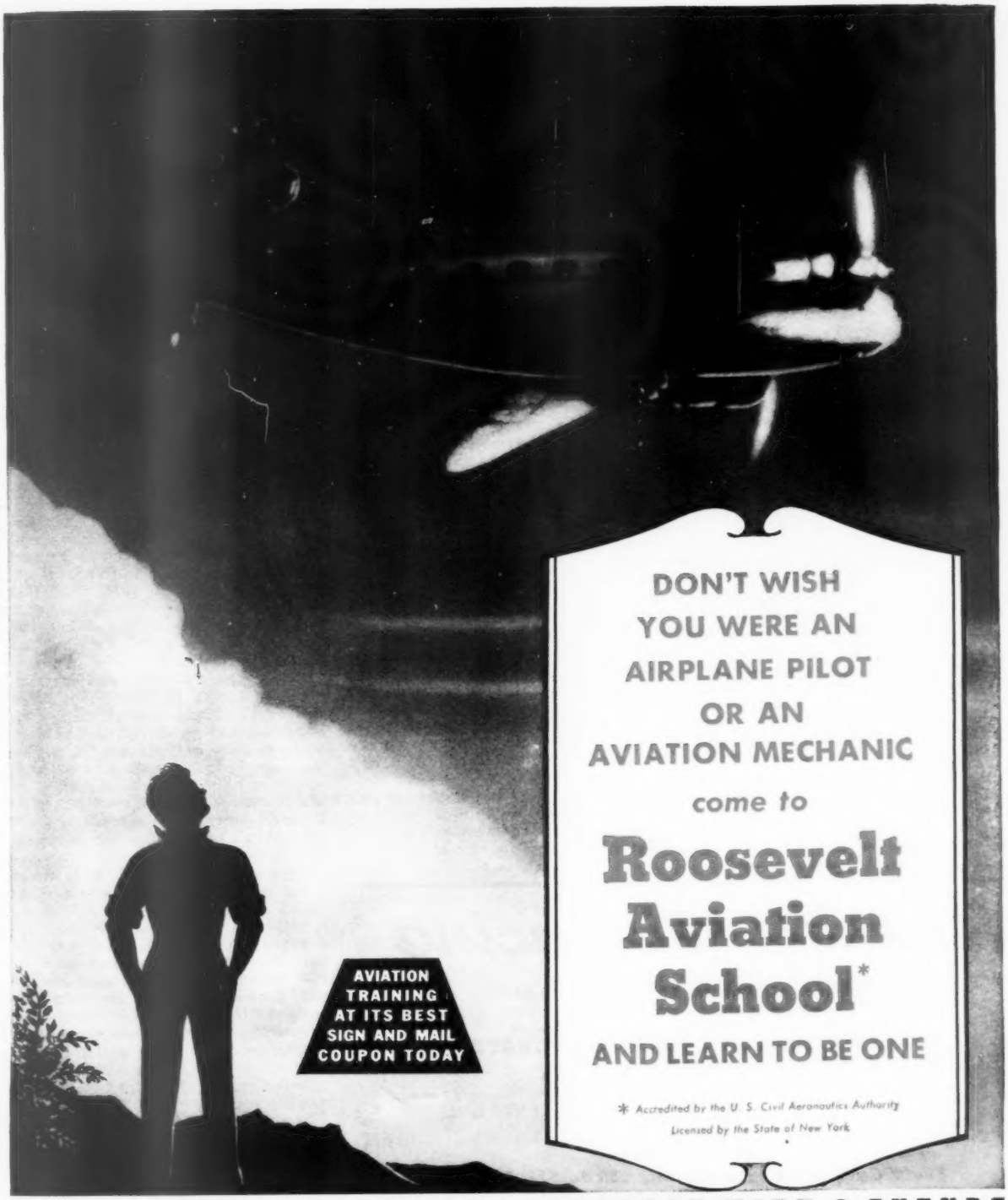
He regards his flying feat of 620 m.p.h. matter-of-factly and simply as a means of slightly dangerous breadwinning.

"The only reason I did it," he admits freely, "was because of the money. It paid a pretty fine price and I needed it."

The contract of the chief test pilot for Bell did not call for him to put the *Airacobra* through its paces so, when McDonough heard of the opportunity from the chief test pilot (a friend of his when they were both flying for the Navy), he applied for the job. He had all the qualifications and was given the job with its "pretty fine price."

In preparing for the speed test, McDonough put the ship and himself through a series of graduated speeds before diving at the speed supreme.

"A man would be a fool, naturally, to take a strange ship up and put it through severe tests without first acquainting himself with it thoroughly," he says. "I



MAKE YOUR FUTURE IN THE INDUSTRY WITH A FUTURE

SUMMER CLASSES START JULY 7, 1941

ROOSEVELT AVIATION SCHOOL—at Roosevelt Field, Mineola, Long Island, N. Y.

Without obligating me, send details of course checked:

☐ PRIVATE PILOT ☐ COMMERCIAL PILOT ☐ COMBINATION FLIGHT-MECHANIC
☐ MASTER AIRPLANE & ENGINE MECHANIC

Name..... *Age*.....

Street Address..... *Town*..... *State*.....

P.A. MAY, 1941

took it up and got acquainted with it six days before I made the real test. I flew it faster each day, starting at about 350 and jumping up the speed limit about 50 miles each time. The day before the final test I dived it at 530 m.p.h."

Then came 11 a. m. on the morning of January 8. A physician gave the pilot a thorough check and mechanics went over the *Airacobra* just as thoroughly. In addition to the usual recording instruments, a movie camera was fixed in the cockpit to register the highest speed obtained by the speedometer needle. McDonough, clad in cold-resistant leather flying suit, swung into the plane, checked his instruments and gunned for the take-off. The *Airacobra* skimmed across the Buffalo airport, tucking in its three legs as it rapidly gained altitude.

"I started to take in oxygen at 14,000 feet," McDonough said, "and when I reached 27,000 feet (a little more than five miles) it was 33° below zero outside the cockpit."

Niagara Falls was an irregular silver ribbon 25 miles to the lone pilot's northwest. He was 15 miles northeast of the field when he reached 27,000 feet and made a final check of his instruments.

"I radioed the ground force I was going to dive from west to east. From then on I didn't give any reports. I was too busy watching my instruments and seeing the ground rush up at me. It comes up in an awful hurry when you're traveling 600 m.p.h. toward it.

"I eased out of the dive at about 5,000 feet, the plane responded perfectly to the controls and that's all there was to it."

Just a record-breaking dive test, that's all. Faster than man ever flew before. And the pilot who did it debunks the lurid descriptions of physical sensations experienced upon pulling out of a steep dive.

"I didn't experience any unusual sensations. I breathed normally the entire time. I didn't go blind when I pulled out of the dive at 5,000 feet. I didn't feel like screaming and blood did not gush from my nose and mouth. I did not suffer any blackout."

Which probably goes to show, not that pulling out a dive isn't a bit hard on the pilot, but that McDonough is an A-1 physical specimen. The doctor who checked him thoroughly again when he landed pronounced him in just as excellent condition as when he took off.

After his test, McDonough said he thought of that now-famous problem: "I wondered what would have happened if I could have fired a pistol back over the tail. At that speed would the bullet have rolled out of the barrel and then fallen back?"

Ballistics experts have assured McDonough that what he suspected would be theoretically probable to happen. They explained that at 620 m.p.h., the plane's speed was 909 feet per second while the muzzle velocity of a .45 caliber pistol bullet is 802 feet per second. Thus, theoretically, the bullet would have been propelled to the barrel opening where its speed then would be more than nullified by the plane's speed. Gravity then would replace the normal muzzle velocity and the bullet would fall to earth. If fired ahead of the plane, of course, the bullet would have had both the muzzle velocity and the speed of the plane behind it.

Although 620 was the top speed attained in his dive, McDonough believes the *Airacobra's* highest speed may be around 700, if pushed to the limit. He thinks the time isn't very far away when another ship will be built that will travel 700 or 800 m.p.h. And if it pays a "pretty fine price" to test and he can use it, he'd just as soon fly it, too.

"They used to think planes couldn't fly faster than 350 or the wings would be torn off by the air pressure," he says. "But the designers got around that and I think they'll get around the other theories which now try to show the plane would fall apart at speeds greater than presently attainable."[1]

McDonough got his first training in the U. S. Navy. The story of his life, in brief, began with Mantorville, Minn., dominating chapter one. He was born in that small town and went to high school there. He followed his elder brother to the University of Wisconsin at Madison. His brother, Dr. F. E. McDonough, now is on the Mayo clinic staff at Rochester, and is licensed as a private pilot.

At Wisconsin Andy took pre-law, played baseball and shot on the R.O.T.C. rifle team. He held a commission as second lieutenant in the infantry reserve from his R.O.T.C. training, but gave up that commission and his legal ambitions to take flight training when the Navy made room for civilians in its expanded program.

Up to that time, only Annapolis academy graduates and officers on duty with the fleet could take training. Then the bars were let down to admit college men, with strict physical requirements. Andy McDonough, like many another aviation-minded collegian, jumped at the chance to learn how to fly and soon passed from the Great Lakes training station in Illinois to Pensacola in September, 1935. The course at Pensacola took between 11 and 15 months to complete at that time, but now has been pared and condensed into seven months.

McDonough graduated from Pensacola on December 23, 1936, and spent a year each on the aircraft carriers *Lexington* and *Ranger*, before being returned to Pensacola to serve as instructor. In all that time, he had the ranking of aviation cadet—an injustice to many good pilots which was not remedied until 1939 when Congress provided that Pensacola graduates should be commissioned upon joining the fleet. The advantage in a commission is in the amount of pay, an ensign receiving about $100 more monthly than a cadet.

As contracted, McDonough gave his four years to the U. S. Navy and two days after his release, on September 23, 1939, he was married and began service with Eastern Air Lines. He makes his home in Atlanta and flies, at the time of this writing, the Atlanta-Chicago run. He has one child, a girl, and intends to continue in his commercial aviation career—Congress, Navy and the world situation permitting.

As a test pilot of what may be the best pursuit ship now existent and, as a former Navy dive-bomber, McDonough's opinion on military aviation might well be regarded here. His experience while serving with the fleet has convinced him that dive bombing is the most potent technique of aerial attack. The U. S. Navy discovered the merits of dive bombing

[1] There is plenty of support given McDonough's belief that much faster airplanes will be built, perhaps soon. For example, John E. Canady, Lockheed Aircraft official, told the Iron, Steel and Allied Industries' conference at Del Monte, Cal., recently that "speeds up to 1,000 miles per hour and faster are well within the realm of possibility. We used to think that there were definite limitations on both the size and speed of airplanes," Canady said. "But now our engineers believe these factors have no limits."

Aircraft Financing

"LEARN TO FLY IN YOUR OWN PLANE"

Keeping step with the progress of the aircraft manufacturers, their distributors and dealers

THE NATIONAL DISCOUNT CORPORATION

Announces

Their finance plan now includes a major improvement in the insurance coverage being offered to private flyers, clubs and operators . . .

100% Coverage on Ground Losses

NO PARTICIPATION

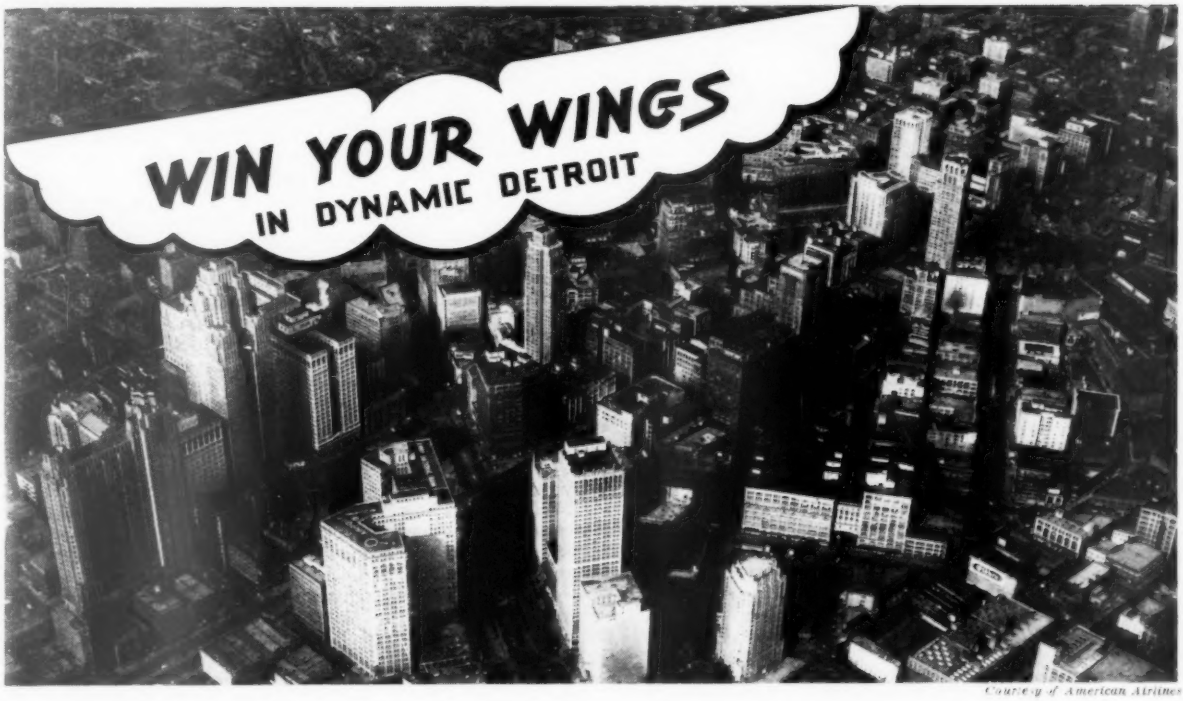
Flight Coverage Improved from $50 to $25 Deductible

No Increase in Rates

NATIONAL DISCOUNT CORPORATION

Aircraft Financing

SOUTH BEND, INDIANA



Courtesy of American Airlines

★ ★ ★ It is only natural that one of America's outstanding Aviation Schools should be located here—among the men and machines that build the nation's motors. The geniuses of automobile mass production are now turning their talents to airplanes. Thus, the AMERICAN INSTITUTE OF AVIATION offers—besides the finest aviation training—a ringside seat at these miracle-activities in the world's motor capital.

Aviation opportunities beckon throughout the country and especially in dynamic Detroit—to well-trained A. I. A. graduates. So assure your success by enrolling now!

At the AMERICAN INSTITUTE OF AVIATION'S private airport, you get complete flight instruction in a variety of modern ships. You study all-important ground work. As fast as your ability permits, you advance toward your goal—whether it be on the ground or in the air.

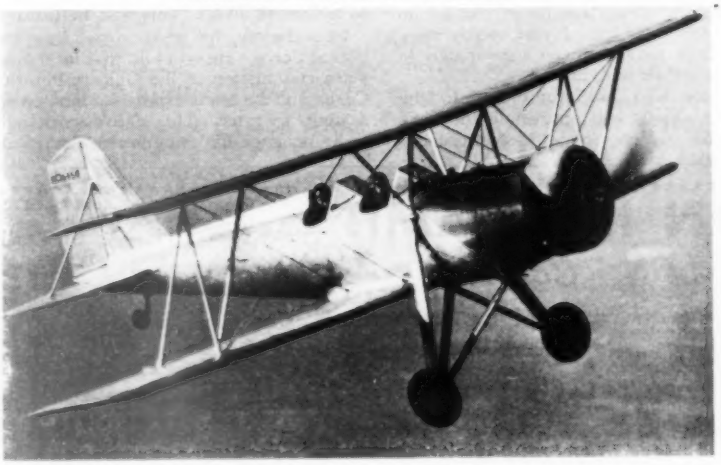
So make aviation your career. Be a person who *does things!* Enroll at the AMERICAN INSTITUTE OF AVIATION now.

•

AMERICAN INSTITUTE OF AVIATION

Joy Airport, Frazier (Detroit), Michigan

In such sleek, metal trainers as this, students receive flight training at the AMERICAN INSTITUTE OF AVIATION.



MAIL THIS COUPON TODAY!

Aviation's the career for me! So rush the new A. I. A. Catalog, with details of courses checked below.

Commercial Pilot Course..... ☐
Flight Instructor Course..... ☐
Special Acrobatic Course..... ☐
Private Pilot Course..... ☐
Airplane and Engine Mechanic Course.... ☐
Ground Instructor Course..... ☐

Name ..... Age.....

Street .....

City ..... State.....

and began practicing it in 1925. As the world now knows, the famous German *Stukas* showed the efficiency of the technique in the recent Nazi conquests.

"Dive bombing is practically impossible to stop once it gets going," says McDonough. "I personally feel that if any good test pilot gets within 30 miles of his target, nothing can stop him. There are so many ways of attacking. You can dive down with the sun at your back or you can use clouds as detection shields and suddenly attack from them. Horizontal bombing can't be nearly as effective, despite bomb-sights. Anti-aircraft defenses keep big bombers up so high a zig-zagging boat has a chance to dodge. Also, in sighting while flying horizontally, a smooth and level run is necessary before a bomber can get good results."

So far, the Navy and marine force are the only U. S. services to exploit dive bombing. The Army has not yet adopted it to a wide extent and McDonough, as a Navy man, feels this is a technical lapse that should be overcome.

As to the ability of the United States' flying personnel, the cautious Scot believes longer training than is afforded pilots of other nations is advantageous, but points out that U. S. pilots naturally lack vital experience.

"Only one way to get it, too," he feels. "If a combat pilot has luck with him he may come safely through his first fight. If he comes through it, he gets experience."

McDonough, however, hopes he'll be permitted to get more experience as an airline and test pilot. From his record-wrecking whirl at test-piloting the *Aircobra*, McDonough gained a nice sum of money, recognition, a suspended sentence in Atlanta and—last and probably least—a nickname. In joshing tribute to his 620 m.p.h. mark, his comrade pilots now call him—you couldn't guess, could you?—"Speedy".

END

Armament School

A NEW and novel course for commercial aviation schools has been announced by the Aero Industries Technical Institute in Los Angeles. The course is called Armament Design and, according to J. L. McKinley, director of the school, has been instituted "because of the great scarcity of men versed in this vital phase of modern aeronautical engineering. This new division of the school is headed by Harvey G. Chapman, Jr., former armament engineer with Boeing, Douglas, Lockheed and the government aircraft factory in Sweden.

Airport . . .

(*Continued from page 47*)

People watching planes take off safely and land safely are coming back to fly some day—maybe for business, maybe for pleasure, maybe because of an emergency. But, however you figure it, they've been sold transportation.

So famous has the Sky Room—a restaurant specializing in sea food flown from Seattle, and southern fried chicken—become that it is packed as long as it is open. It's becoming internationally famous and is winning airport fame and airline customers at the same time.

When Steele came to Union Air Terminal in December, 1937, the second floor of the administration building was a wind-swept deck. There was a small bar and a coffee shop. The garage was painted an unattractive olive drab and was pumping 4,400 gallons a month. Now it pumps four times that amount and will have to be doubled in size to take care of the storage of cars by passengers.

Steele has only started. He sees in the future a need for an airport which will serve the private pilot. In a year or so—perhaps longer—all of the airlines will go over to the Los Angeles Municipal Airport. Landings will be made only at Union when weather conditions make them necessary.

"Our main objective when the airlines move," says Steele, "will be long range and will be to make Union the finest airport in the United States for the private flyer. To accomplish this we must have facilities which are second to none."

Steele has in the back of his mind an expanded restaurant, a swimming pool, badminton and tennis courts and other amusements.

Another problem which Steele has been battling is parking. This is a major issue in airport operation. Steele has thought only of the public and has had all employees in the terminal move their cars to outlying parking places so that the public may park close to the administration building.

Green lawns, ample opportunity for the public to view operations, shade trees, dustless surroundings and a general "open door" policy which runs from benches on which spectators can sit to excellently maintained rest rooms have all been a part of Steele's campaign to win the public to flying.

Anyone who has stumbled into the average airport can appreciate the conveniences which Steele has afforded—conveniences which have made Union Air Terminal pay its way and which have returned dividends to the operating company. Spectators have been forced to drive over rough, even dangerous entry roads, denuded of shrubs or other greenery; have been dusted by airplane blasts; have found it impossible to find even a drink of water; have found inadequate sanitary conveniences, food of poor quality (if any); have had no place to park, let alone store a car—and usually have been "shooed away" from any point of vantage. Passengers have waited in cold, draughty waiting rooms; have found poor taxi service to and from fields; have had little or no baggage service and have suffered countless unnecessary inconveniences.

In each one of these spots there's a job for a man who has the interests of aviation at heart, who knows how to meet the needs of all those people who each day, each month, each year, are coming in closer and closer contact with air transport and with aviation. As far as the service to private pilots is concerned—every pilot knows what aviation needs. On some of today's airports it is impossible to get even gasoline. There are few fields which offer food of any kind without a trip to town and there are too many fields which don't even offer telephone service to the visiting pilot. It's a wide open opportunity.

You probably will never have the qualifications which Dudley Steele offers. Steele is a combination crusader, campaigner, manager, promoter, aviator and business man. He's carried on fights against the gasoline tax levied by various states on aircraft; he's fought for the removal of obstructions around airports; he's been instrumental in the establishment of the first aerial beacons, a private enterprise and he's promoted air meets.

Steele was born in Omaha, Neb., May 18, 1892. After five years at Christian Brothers College, he turned himself loose on the world. He abandoned his father's business—that of wholesale grocer in Omaha and in St. Joseph, Mo., sold shoes, worked in banks and, at times, even ran errands. He was selling shoes at San Antonio and trying to get into a trucking expedition into Mexico—Pershing was looking for Villa—when a Lieutenant Harmon at Kelly Field offered him a ride in a Curtiss JN4D. This was in 1916.

Immediately, he tried to get into the Signal Corps. He was told that he should get a commission in the Officers Reserve Corps and be transferred to Signal with a jump in rank. This didn't work out, so he resigned his commission, started all

LEARN AVIATION IN MIAMI!
Take One Of These ☆ Courses
☆ Sheet Metal ☆ Aircraft Welding ☆ Airplane Mechanic
☆ Private Pilot ☆ Commercial Pilot ☆ Engine Mechanic
The Oldest and Finest Aviation School in the Southeast
EMBRY-RIDDLE SCHOOL OF AVIATION—MIAMI, FLORIDA

WHICH ROAD WILL YOU TAKE?

Yes, there are jobs in the aviation industry today, but as far as the future is concerned, success depends upon proper training in order to make it a career. It is the career that Boeing School of Aeronautics stresses. For in this school you have the choice of 8 different career courses embracing 35 subjects. These are indicated below. If you are ambitious about your future in aviation, fill in the coupon and mail it today.

ENROLLMENT PERIODS: MARCH, JUNE, SEPTEMBER, DECEMBER

CAREER COURSES One specially designed to fit your chosen field of aviation. Check the course or courses you are most interested in:

Courses requiring High School only

- ☐ Airline Pilot and Engineering
- ☐ Airline Operations and Engineering
- ☐ Airline Mechanic and Operations
- ☐ Aeronautical Engineering
- ☐ Airline Mechanic
- ☐ Aircraft Sheet Metal
- ☐ Private Pilot

Courses requiring 2 yrs. of college

- ☐ Air Transport Engineering
- ☐ Airline Pilot Course

Courses for engineering graduates only

- ☐ Airline Technician
- ☐ Airline Meteorology

Courses requiring special training

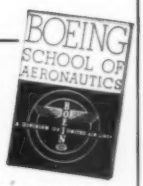
- ☐ Special Airline Pilot
- ☐ Instrument Rating

NOTE: Link trainer and modern multi-motor instruction available to students in all courses.

Full credit is allowed for flight instruction sponsored by the Civil Aeronautics Board

Boeing School of Aeronautics
3051, Hangar No. 5
Airport, Oakland, California.

GENTLEMEN: Please mail me—without charge—the Boeing School descriptive booklet containing complete information on the school and describing in detail the courses I have checked at the left.



Name .....

Street Address .....

City .....

State ..... *Age* .....

Previous Schooling .....

BOEING SCHOOL OF AERONAUTICS UNITED AIR LINES A DIVISION OF UNITED AIR LINES

MORE PLANES... MEANS MORE INSTRUMENTS

...AND MORE INSTRUMENT MEN NEEDED

To the ever-increasing numbers of great airliners plying the air lanes are now being added the mounting thousands of military and training planes needed in the huge defense program of this country and other nations. Trained instrument men are sorely needed by aircraft plants, airlines, instrument manufacturers, and Army and Navy repair bases (civilian instrument technicians under Civil Service).

Grasp this big opportunity for a fascinating position in Aviation . . . on the ground . . . in work where you will be needed more and more. Train at American School of Aircraft Instruments . . . so splendidly equipped that it is a C.A.A. approved instrument repair station. Specialized training on Sperry gyroscopic instruments included. Choice of four courses—one all home study. For details—send coupon NOW.

AMERICAN SCHOOL OF AIRCRAFT INSTRUMENTS
3903 SAN FERNANDO RD., GLENDALE (Los Angeles), CALIF

Dept. PA-5 Please send information on aircraft instrument opportunities and your specialized training.

Name _____ Age _____

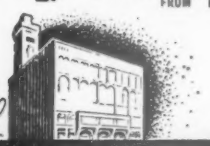
Address _____

City _____ State _____

MICHIGAN AVENUE
WHERE
CHICAGO
Lives

● The pulse of the city — Michigan Avenue. Chicago works and plays to the tune of its rhythmic hum. In the most convenient location on this famous thoroughfare, Hotel Auditorium provides spacious pleasant rooms, excellent service and superb cuisine, at reasonable rates.

WITH BATH FROM $2.50 WITHOUT BATH FROM $1.50



Hotel
AUDITORIUM

MICHIGAN AT CONGRESS GEO. H. MINK, Manager

10th OF EVERY MONTH...
is the day to look for the new issue of FLYING and Popular Aviation at your newsstand . . . .

over in Signal.

He soloed at Ellington, was transferred to Camp Dick, Dallas, where he and Lieut. Wendel Brookley introduced the Gosport system of instruction. He then went to Scott Field, Belleville, Ill., as post athletic instructor—he'd been a swimming and diving star and was outstanding in all forms of athletics—and shortly thereafter introduced a "first."

The "first" was an air show at Scott. Steele talked his commanding officer into opening the field, arranged a series of air stunts and athletic events, commandeered enough cars to make up a special train from St. Louis, played to 45,000 people and $12,351 in paid admissions. This was his first real promotion.

"The idea," he says, "was to let the public in on what the Air Corps was doing, get them enthusiastic and then sell them patriotism."

Maj. A. W. Robbins, his commander, wanted to reward him for his contribution to the athletic fund and asked him at a banquet what his wishes were. They were to "fly overseas." He was sent to Miami, Fla., to learn flying boats which, Major Robbins contended, with a smile, was "flying over seas."

Duty at Carlstrom and Dorr fields, in Florida followed, with discharge in February, 1919. Steele's next promotional adventure was with the Roy Nafziger bakeries, serving Missouri, Illinois and Oklahoma. He got Nafziger to buy a "Canuck" Jenny, used it to ferry Nafziger around to his various bakeries. He was "first" again with a successful idea of putting tickets for free airplane rides in bread loaves, developing other advertising and exploitation ideas.

In 1921 he promoted an air show in Kansas City with the Kansas City Flying Club, which he had organized, for the national convention of the American Legion. Then, in 1922, he helped Inglis M. Uppercu run the Pulitzer races, established the Washington offices of the N.A.A. and was the first contest chairman.

From 1922 until 1926 he took a fling at selling shoes and doing exploitation for California theaters, which resulted in his accepting the job of organizer and manager of the aviation department of the Richfield Oil Company in 1926. Under his supervision Richfield, using its own money, established the first aerial beacons, a route which extended from San Diego to Vancouver. This beacon route antedated the Federal Airways system and was used extensively by both private pilots and Pacific Air Transport.

Steele helped various communities on the west coast to establish airports, handled the gasoline arrangements for Richfield at various air races including the nationals at Cleveland for several years —one year Richfield was used in 95 per cent of all participating planes—and campaigned for more private flying.

When Richfield's aviation department was disbanded in 1937 it had owned nine airplanes, had flown 2,100,000 miles and had carried thousands of passengers with a record of no accidents—a mark which has not been equalled by any other oil company. In the Nafziger days, Steele had established precisely the same record.

As chairman of the aviation committee of the American Legion in 1935 and 1936, Steele launched two drives—one to get various states to either use money secured from taxes on airplane gasoline for the improvement of aviation facilities or make the refunds on such taxed gasoline easier to secure. The other was to eliminate hazards around airports such as telephone poles, wires and high trees. With the assistance of his long-time secretary, Margaret Heckman, he sent out 15,000 pieces of literature on the subject in a single month. Both drives were eminently successful.

"But there is still a lot to be done," Steele says.

Today, Steele receives letters from airport managers in all parts of the United States asking for information on the operation of concessions, police and traffic regulations and many other problems. He answers them all, from San Diego to Maine and from Washington to Florida.

"I definitely feel that there is a great future in airport management," he declares. "The time has come at last when airports of any size, if intelligently managed, can be put on a paying basis. The first step is to make an airport attractive by offering conveniences and facilities to the public. Then the public will start coming to the field and from then on patronage will increase.

"But an airport manager must be on his toes. He has to remember at all times that he must serve both the public and private flyers as well as the airlines themselves. He must watch all the angles, all the time. The public only indirectly feels efficient management. It becomes directly concerned with mismanagement. And the manager will attract only the type of people to which he caters. If his service is high class, he'll find responsible people coming to his airport and will genuinely increase interest in aviation."

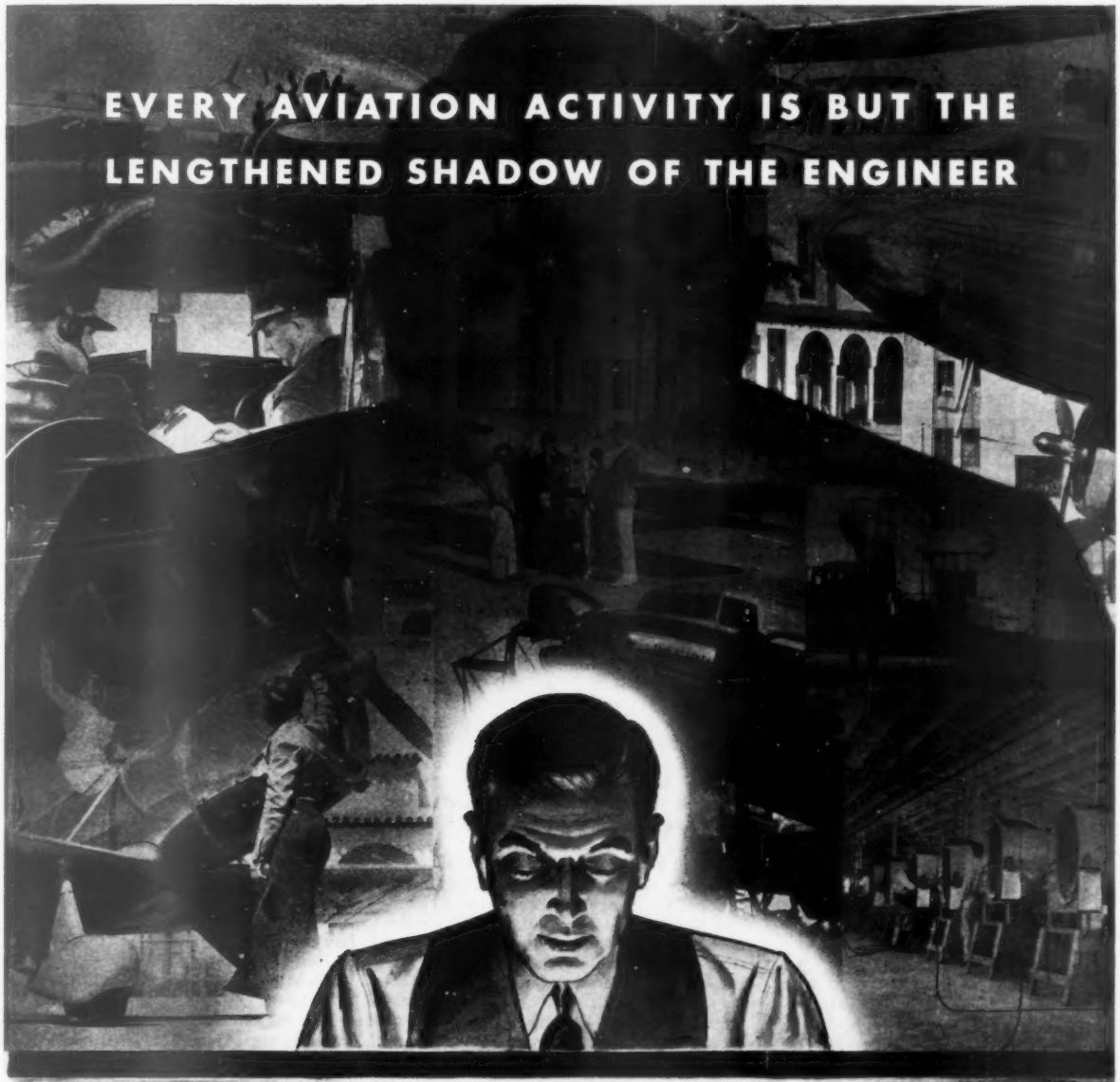
Steele looks forward to the development of Union Air Terminal under Lockheed management after the airlines have left it. He sees an opportunity to prove his theories and practices in winning and holding much of the private flying business in Southern California.

"More airplanes will not be sold until service is built up," he says. "The battle is not to get a private flyer to buy an airplane but to offer him facilities which, after he buys it, will make him want to keep it and sell the idea of private flying to others."

END

Hey, Seaplane Owners!

A FIRE recently occurred in which the pontoons of a plane—being used as a landplane at the time—were destroyed. According to Aero Insurance Underwriters, the owner found to his dismay that he had insured his ship as a landplane and had neglected to add coverage for the pontoons. So pilots are cautioned to insure both wheels and pontoons if they have them. There is a different rate for seaplane insurance and insurance policies must be properly endorsed when shifting from landplane to seaplane.



In no other industry does the engineer play so important a role as in Aviation. What planes to build? *Ask the engineer.* How to manufacture and test them? *Ask the engineer.* How to fly and maintain them? *Ask the engineer.* Through his applied training aviation goes forward on every front. If you have graduated from high school or have an equivalent education you can qualify for a Ryan course that will start your engineering career three years ahead of college trained men. Send the coupon for facts.

RYAN

SCHOOL OF AERONAUTICS ★ Engineering ★ Mechanics ★ Flying

RYAN SCHOOL OF AERONAUTICS, Lindbergh Field, San Diego, Calif.
Please send me without obligation full information on courses checked: PA-5

FULL NAME_____ AGE_____
STREET ADDRESS_____
CITY AND STATE_____
Please Print or Type

ENGINEERING
◯ Aeronautical Engineering
◯ Airplane Drafting & Design
FLYING
◯ Master Pilot
◯ Commercial Pilot
◯ Private Pilot
◯ Instrument Flight
◯ Instructor's Course
◯ Advanced Navigation
◯ Master Radio Course
MECHANICS
◯ Master Mechanics
◯ Sheet Metal-Riveting

Super-Service Specialists

(Continued from page 17)

they were equipped with the proper tools. And, at the same time, reconstruction work was still going on. A room which was nothing more than a cement floor bounded by veneer and tin walls was soon entirely rebuilt. Proper walls were installed and painted. Leather furniture of substantial construction was purchased. Tables blossomed forth with the latest magazines.

Another room was fitted up with lockers for regular customers who wanted to fly open ships, store goggles, helmets and flying suits. Plumbing, such as it was, was torn out. Showers were installed. And the ladies got their own fastidious little powder room with dressing tables, mirrors and all. Arlen, with an eye to entertaining his own friends and those of Probert, opened his own private reception room up on the second floor.

One by one, pilots went to work. Pretty soon there were four. They were given their own quarters where they could rest and relax. And, to make sure that he got top men, Arlen combed the industry and, offering to pay $50 per month more than other operators were paying, got the kind of men he had to have.

You've probably stood around in the sun waiting for a chance to fly. Well, Arlen remedied that, too. He oiled the outer ramp, painted the inner cement section green and waxed it, installed a huge awning, bought a couple of dozen stout, gaily painted chairs and tables. That helped with the feminine trade, as well as the masculine.

"We're selling aviation," Arlen says. "We're selling private aviation the new, modern way. You'll find as many as 50 or 60 pilots, from embryo "aces" to veterans with thousands of hours lounging around. Sometimes, many don't fly. They just come out to pass the time of day with their friends, to do a little ground flying. They know they're welcome, whether they fly or not."

There isn't enough trade right now to warrant the leasing of space to a concessionaire. However, if you want a pack of cigarettes you don't have to walk a mile for your favorite brand. And if you want a cold, refreshing soft drink there are automatic vendors to supply you.

Arlen's staff now includes three office workers; the four pilots previously mentioned; six hangar workers and a clean-up boy, whose sole duty is to wander about picking up, tidying, taking care of this and that, retaining a club house atmosphere rather than an "after the carnival" one, with candy wrappers, cigarette butts and old newspapers strewn about.

"I would estimate," Arlen says, "that at present, we have approximately 125 private pilots flying with us. We have a ground school just starting. We have the CAA school, too—primary training. At present, we have 20 CAA students. It looks as if we'll expand and absorb an advanced training school as well."

Arlen's customers are strictly "run of the mill." His prices on insured ships are standard and competitive with other operators in southern California. While many of his friends, including Roscoe Ates, the famed stuttering comedian; Wayne Morris, stalwart young film leading man; Barton McLane, character actor; and Don Barry who draws the "Red Ryder" cartoon strip, are on his operations reports—and while Robert Taylor stores his plane with Arlen-Probert—Dick has no "de luxe" ideas about prices. At present he's put in far more than he has taken out of the business, but that doesn't bother him. He says:

"I'm gambling on getting intelligent customers who appreciate good equipment and service. I'm figuring on a long pull, too. I don't expect to break even tomorrow or the day after. But I do have faith in private aviation and I do feel that good service will eventually result in a successful operation.

"I'm going to keep on buying and adding equipment. I'm going to plug 'safe and sane piloting in safe and sane ships.' Private flying cannot go ahead without this type of service. There's plenty of thrill in learning how to solo a ship and in getting those first few hours. But, after a pilot has graduated from the stage, he begins to look around to see what he's getting in the way of facilities, ships and opportunities to fly where he wants to, when he wants to and safely. He doesn't want bad roads into fields, dirt and dust, lack of comforts, battered and unsafe equipment, indifference and inattention.

"At the close of the World War there were thousands of pilots in the United States. There were 29,000 airplanes, too. But, because of poor facilities, there were only a few hundred pilots in the country in the twenties. And, in the thirties—even after the 1929 boom—there were less than a third this many planes. There's a war on now. A lot of people have learned to fly. If we don't give service, however, the pilots will 'go to seed' and no more equipment will be sold and we'll be right back where we were a few years after peace comes again."

The present Arlen-Probert equipment includes six 50 and 65 Luscombes, three 50 Piper *Cubs*, two Porterfield 50's, a Davis, a Travel Air biplane and a four-place Fairchild "24". Arlen doesn't know what he'll buy next—he'll see, first, what the students and private flyers want.

"The two big things that I've noticed since getting back into the business," Arlen says, "are first, that women are flying more and more and, second, that there is much more cross-country flying. We are getting more and more calls for planes to go here and there and yon."

Mrs. Probert, Dick says, is the answer to a career for woman in aviation. She is a skilled pilot herself. And, in addition to that, she's worked out a career for herself in the office end of the business. She's the official meeter, greeter and plane dispatcher.

Arlen's first experience in aviation came at the tender age of 16. When, in 1917, the Army refused his plea to let him become a pilot, he went to Canada from his home in St. Paul, Minn. He was born Richard Van Mattemore on September 1, 1900. He had been educated at Central High School at St. Paul and later at St.

$5 DOWN buys this new Sensational 6 IN 1 ARISTO CHRONOGRAPH DIRECT FROM THE IMPORTER!

1—Accurate TIME PIECE
2—Sweep-Second STOP WATCH
3—Elapsed Time RECORDER
4—"Time Out" BUTTON CONTROL
5—M P H TACHOMETER
6—Distance TELEMETER

The Most Complete AVIATION WATCH in the World!

Now you can own a famous 17-jewel ARISTO CHRONOGRAPH—the most complete and versatile watch in the world—for only $5 a month! Buy it for only FIVE DOLLARS DOWN. Just the thing for men or women in AVIATION. ALL the advantages of SIX watches in ONE compact, handsome wristwatch!

SIMPLE—RUGGED—FOOLPROOF!

First, the ARISTO is a precision built timepiece of dependable accuracy, with genuine pigskin strap. Two small buttons control all of its easy-to-operate features. Stop watch sweephand registers 1/5th seconds. Elapsed Time recorder-dial gives elapsed time reading instantly. The "Time Out" feature is essential, when your timing operation is interrupted! Tachometer scale indicates M P H over known distance. The Telemeter scale shows your distance from any simultaneous sight-and-sound source in miles and fractions.

10 DAY TRIAL OFFER!

Pay only $5 down on delivery of your ARISTO Wrist CHRONOGRAPH. Wear it for 10 days on our Money-Back Guarantee. If not delighted with your ARISTO, you will have the privilege of returning it in 10 DAYS and your money will be refunded without question! Fill out and mail the coupon today!

1 YEAR GUARANTEE

ONLY $5 ON DELIVERY SEND NO MONEY!

ARISTO Lifetime Watches

ARISTO IMPORT CO., Inc., 630 Fifth Ave., Dept. A-5, N. Y. City
☐ Send ARISTO 6-in-1 CHRONOGRAPH Wrist Watch, at REDUCED PRICE of $35.00. I will pay $5 on delivery and $5 a month.
☐ Send ARISTO CHRONOGRAPH at Cash Price of $32.50.
☐ Check enclosed. ☐ Send C.O.D.
NAME..... AGE.....
ADDRESS.....
CITY..... STATE.....
EMPLOYED BY.....
ADDRESS..... HOW LONG? .....

Prepare for a Well Paid Career in—
AERONAUTICAL ENGINEERING!

Bachelor of Science Degree in 108 weeks. Training thorough and complete in all fundamental engineering subjects in minimum time at least expense. Tri-State graduates in Mechanical Engineering can complete aeronautical course in 2 terms (24 weeks). Modern wind-tunnel, latest equipment. Convenient flying school facilities. Flight training available under C. A. A. Aeronautical training is the key to success in the great and growing aviation industry. Tri-State graduates hold responsible positions with leading airlines, manufacturers and other companies in this well-paid field. Also world-famous for technical 2¼-year courses in Civil, Electrical, Mechanical, Chemical, Radio Engineering; Business Administration and Accounting. Living costs, tuition low. Special preparatory department for those who lack required high school work. Enter June, Sept., Jan., March.

Write for catalog.

DEGREE IN 2¼ YEARS 751 COLLEGE AVE. ANGOLA, IND.

TRI-STATE COLLEGE Founded in 1884

MAJOR AIRCRAFT FACTORIES SPECIFY—

★THIS TYPE OF TRAINING FOR MEN THEY SELECT FOR EMPLOYMENT

Here at Fletcher you train side-by-side with men selected and sent to this school by such major factories as Lockheed, Vega, etc., for their own pre-employment training.

This is factory planned training—taught by factory men—which can prepare you, too, for work in major aircraft plants on the broadest possible employment basis.

Fletcher trained men have what it takes to get and hold the work they are given to do. Two thousand four hundred Fletcher trained men have gone to work in the last 12 months—most of them assigned to special positions in the Experimental, Final Assembly and Tooling departments of major factories.

Yet today we are called on for many times the number of trained students available. Because of this situation, you should act at once if you are seriously interested in building a secure future for yourself in aviation. Before you enroll Fletcher gives you factory approved aptitude tests to make certain that you can put this training to gainful use. Convenient Bank of America terms are available. The coupon will bring you complete information. Send it Airmail TODAY.

Fletcher
AIRCRAFT SCHOOLS

GEARED TO THE NEEDS OF THE INDUSTRY

Fletcher Aircraft Schools
245 Fletcher Building, Burbank, Calif.

Please send me complete information on the course checked.

- ☐ 8 Weeks Metal Fabrication
- ☐ 12 Weeks Production Assembly
- ☐ 7 Months Aircraft Production & Service
- ☐ 10 Months Industrial Aviation

Name_____

Address_____

Thomas Military Academy. He enlisted as a flying cadet in the Royal Flying Corps in the late summer of 1917 at Winnipeg. He was sent to the discipline school at Toronto, attended the School of Aeronautics at Toronto University and began his flying career at Camp Borden. He put in between 40 and 50 hours of flying at various training fields, and was commissioned in November, 1918, shortly after the Armistice was signed. Then he stopped flying. "As I've pointed out," he says, "the facilities were rotten."

Not only that, but he didn't have much money and he had to work for a living. He became a sports writer on the Duluth *Tribune*, worked in the Texas oil fields and was heading for South America and a job with an oil company when he dropped in to visit Hollywood. While in the film capital, he learned that a revolution had broken out in Colombia, where he was going, so he decided to stay. He got a job delivering film on a motorcycle, broke his leg when hit by a truck and, when he emerged from the hospital, so many people had become interested in him that he had chances to do "extra" work.

In 1927 he'd become something of a success and he was cast with Buddy Rogers in "Wings." He and Buddy went to San Antonio, Tex., and soon found that they were going to have to do plenty of flying. In those days the actors, accompanied by an Army Air Corps pilot, flew their own ships while cameras, fixed either in front of them or behind them, recorded their emotions. Rogers learned to fly then, too. He has his own plane today, flies it around the country.

"Lieut. Rod Rogers was assigned to me," Arlen recalls. "I got in about 125 hours with him. I could never fly solo, but I handled the ship all the time. We flew from Kelly and Stanley Fields, flying Voughts and using MB-3's on the ground, as near as I can remember."

After "Wings" was made, Arlen again tried private flying with the same disastrous result. Equipment was ramshackle, ships were too expensive to buy and maintain, there was no such thing as service and prices were beyond all reason.

"I didn't realize until last year what the lightplane had done for aviation," he says. "I met a barber, Tom Wolfe, at Lakeside golf club where I play. I didn't even know he could fly. One day he said he'd drop in and see me on my ranch at Northridge, a few miles from Metropolitan Airport, using a rented plane. I didn't think anything more about it until one day he circled low over the house, glided down and landed on a field a few hundred yards away. I went out to pick him up. Before long he 'sold' me. I met Probert, went for a ride and it wasn't many months after that that we formed our partnership."

All this talk of aviation might lead the reader to believe that Arlen has deserted motion pictures. Nothing could be farther from the truth. He's being starred by Universal with Andy Devine in a series of pictures and his latest venture is a series of aviation pictures, the first to be "Power Dive," produced by William C. Thomas and release by Paramount.

"The new series of aviation pictures is a nice hook-up," Dick says. "At least, when people see me on the screen they'll know that I'm not an actor trying to look like an aviator but an aviator, after a fashion, trying to look like an actor."

END

New Books!
COVERING
GROUND SCHOOL SUBJECTS

☆ SIMPLIFIED CELESTIAL NAVIGATION—92 pp. prepared by P. V. H. Weems and E. A. Link, Jr. For Air Navigators $3.00
☆ RADIUS OF ACTION OF AIRCRAFT—by Mary Tornich (off the press in August). 168 pp. "as near a self-teacher as a book can be made." Covers navigation requirements of CAR $3.00
☆ INSTRUMENT FLYING. Weems and Zweng $4.00

Also our standard equipment:

☆ AIR NAVIGATION, 578 pp. including instruments, radio and meteorology $5.00
☆ DALTON MK. VII AIRCRAFT COMPUTER $7.50
☆ DEPT. OF COMMERCE TYPE PLOTTER, MK. II $2.00
☆ SPEED-TIME-DISTANCE CALCULATOR $1.00

Order From
WEEMS SYSTEM OF NAVIGATION
ANNAPOLIS, MARYLAND

Quick Shift

(*Continued from page 50*)

the auxiliary fields unsafe for student solo flying. Therefore it would be impossible to complete the basic curriculum of 70 hours of flying time by the deadline, February 1.

"After careful consideration, it has been deemed advisable to move "B" Stage to Bakersfield, where the flying conditions are more satisfactory at this time of year. We are faced with a difficult problem for, to obtain the necessary flying time, we must have our ships in the air by early Monday morning, January 13.

"Never before in the history of the Air Corps has a move of this nature been attempted that will require such organization and dispatch. It will require the co-operation of every officer, cadet and enlisted man."

Colonel Lyon then named Major K. C. McGregor commanding officer of the squadron and Captain T. J. DuBose to be director of the training of the detachment which is composed of the entire instructing personnel of "B" Stage under the command of Captain J. G. Russell, 129 flying cadets and the entire enlisted personnel of the 79 School Squadron under the command of Captain L. O. Brown. Medical, quartermasters, operations and engineering sections were included, of course.

Then things began to happen. Fourteen hours after this conference ended, Lieut. L. R. Hughes, officer of the advance ground echelon, had 12 trucks loaded with the necessary equipment to set up a 60-tent camp and operations station and on their way over the 265-mile trek to Bakersfield.

Thanks to the farsightedness of the Kern County Board of Supervisors, the county airport commission and Airport Superintendent Cecil Meadows, Kern County Airport was ready. A camp site with gas and electric connections, showers and communication facilities was ready, had been constructed six years ago and had won the praise of all Air Corps detachments which had been stationed here. Recent purchases of land had doubled the size of the airport. Rules were worked out for the safety of civilian and Army air traffic. Airports at Taft and Delano, mile-square and smooth as billiard-tables, were placed at the disposal of the Army.

Just 48 hours after Lieutenant Hughes had received his order to move his advance echelon, the camp was ready for occupancy. The main ground echelon, commanded by Lieutenant D. W. Eisenhart, and composed of 74 vehicles making a line two miles long, left Moffett Field and headed southward 37 hours after the order was received. They arrived at Kern County Airport just as the plane piloted by Captain DuBose, heading the flight echelon, touched its wheels to the airport runway.

While they piled equipment into the tents and set up the radio operations station, flight after flight of Vultee BT-13's landed from the north, piloted by instructors and solo students. The entire move had taken just 23 hours after the final order had been issued at Moffett.

On Monday morning at 7:20, the first BT-13 roared off Kern County Airport with a cadet at the controls. Soon 59 other Vultees were in the air carrying students and instructors on the schedule which could not be interrupted if the Army was to have its pilots on schedule. Night flying instruction began on Wednesday, January 15, as the program got under way in earnest.

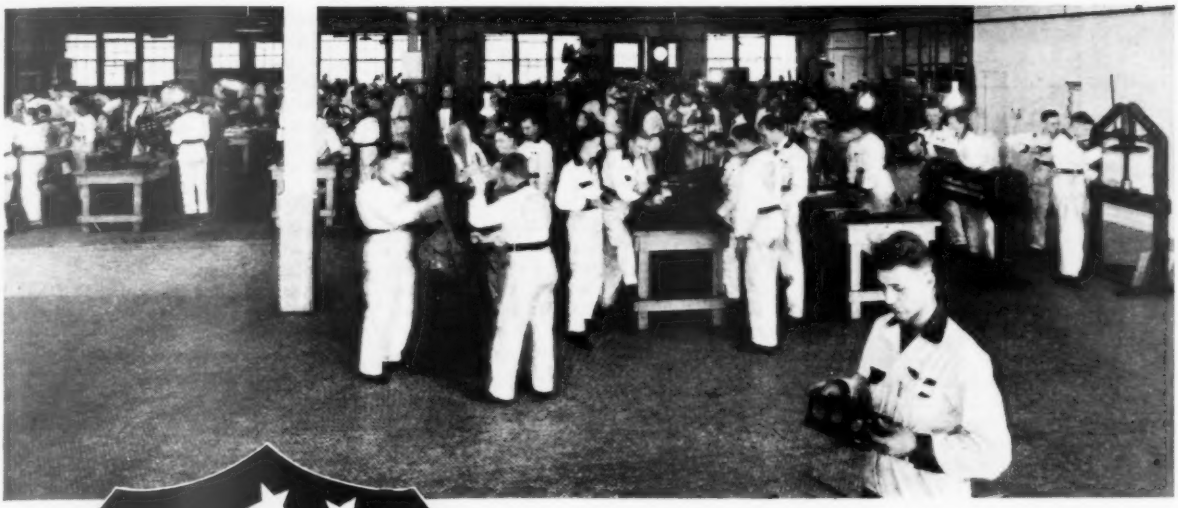
It was an historic move—the transfer of 60 officers, 130 cadets, more than 250 enlisted men, equipment and planes, an entire air training school—more than 265 miles without the loss of a single machine, injury to a single man or loss of a single precious hour.

Tentative plans at this writing are for the establishment of a giant "Randolph Field" in Kern County at Lerdo, 10 miles north of Bakersfield, where 940 acres have been turned over to the Army together with the mile-square Taft airport. More than 1,000 cadets will be stationed here for training, along with 1,000 officers and 2,500 enlisted men. If this comes true, the factor which will have made it possible is this transfer of the 79th Squadron and the excellent weather which made uninterrupted flight training possible.

END

School Expands

BUSINESS is so good at the Lincoln Aeronautical Institute, Lincoln, Neb., that the school is spending $200,000 for an expansion program. The school's mechanics classes and the opening of a branch of the Air Corps Technical School there are responsible for the expansion.



PORTERFIELD TRAINING ADVANTAGES

1. Porterfield training is based on 15 years of actual aircraft manufacturing experience.
2. Training is of "Precision" nature to meet the rigid requirements of aircraft maintenance and manufacturing, and is geared to the needs of the industry to assist you in rapid advancement.
3. During your training you actually see airplanes under construction and study factory methods and operations in the Porterfield Factory. You talk with aviation mechanics who are doing what you yourself will be doing after you have graduated.
4. The school is headed by E. E. PORTERFIELD, JR., Aviation pioneer and aircraft manufacturer for over 15 years, who is nationally known and respected throughout the aviation industry.

Your advancement in aviation depends on your training. If you are considering your future, secure your training from men of experience who KNOW, and where facilities for training offer you these ADDED advantages.

FACTORY TYPE TRAINING!

Factory type training in the Porterfield Aviation School's modern aircraft shops pictured above should qualify and prepare you for rapid advancement in the vital Aviation Industry. Factory type training is your assurance of being prepared!

Realizing the need for skilled workmen, E. E. Porterfield Jr., veteran aircraft manufacturer has established one of the finest aviation schools in the United States for the training of Aviation mechanics.

Complete courses in the following subjects are offered by this ultra-modern, thoroughly equipped school:

Aircraft Welding

Sheet Metal Assembly

Advanced Sheet Metal

Engine Installation

And two long term courses for Aircraft and Engine Mechanics.

Don't hesitate concerning your future in Aviation, write at once Air Mail for full details on this excellent opportunity to GO AHEAD IN AVIATION. "The Sky is The Limit" if you can qualify . . . *Start Now!*

PORTERFIELD AVIATION SCHOOL, Inc.
2423 McGEE STREET
KANSAS CITY, MO.

MAIL COUPON AIR MAIL AT ONCE

Porterfield Aviation School, Inc.
2423 McGee St.,
Kansas City, Mo.

Please rush complete information about Porterfield Training.

Name ..... Age.....

Address .....

City ..... State.....

Pilots Coming Up!

(*Continued from page 38*)

These last 25 weeks have been compressed to 20. The result of this is that there is no longer a separate specialized course. The specialized work has been incorporated into the advanced and some of the training formerly given in the advanced moved up into the basic. Where one section begins and the other ends isn't as clear as it used to be.

The basic student spends 60 to 70 hours in the air. He begins by smoothing out his flying in heavier ships than he flew as a primary cadet. He learns to fly at night, makes his first instrument flights, increases the radius and difficulty of his cross-country assignments, learns more complicated maneuvers. The formations in which he now flies are a little tighter.

The North American BT-9 and BT-14, both of which are substantially alike, are the principal basic trainers so far in use. Vultee (BT-13), Cessna (AT-8) and Fleetwings (XBT-12) models are, however, coming into service rapidly. All are low wing monoplanes with an air-cooled radial engine in the 400 to 550 hp. class (Wright *Whirlwind*, Pratt & Whitney *Wasp*). They are generally two-and-a-quarter ton planes; top speed, 160 to 170 mph., with fixed landing gear.

The Army has one highly interesting experimental basic trainer on order, made by Aircraft Research of Bendix, N. J. Aircraft Research's job is a plastic plane produced by a unique process that, if it works, will revolutionize the plastic plane field as much as the plastic plane itself threatens to revolutionize the rest of aviation.

The advanced course turns out an Air Corps officer with a total flying time of approximately 200 hours. It is in the advanced course that the cadet begins to learn the use of his weapons—guns and bombs. He also learns camera technique, etc., if he is to be an observation pilot.

The basic combat ships—or advanced trainers, as the Army is just now beginning to call them—flown in this third 10-week period are a little heavier, a little faster than the basic trainers and in some cases carry armament. North American and Vultee are the types used.

The advanced trainer's top speed is about 210 mph. There is still quite a gap between this speed and those of modern American pursuits, most of which travel at more than 400 and which have considerably higher landing speeds. They also handle quite differently in other ways.

The air training systems of all the major powers are based on the system worked out originally by the RAF's predecessor during the last war, the Royal Flying Corps. The American is no exception. In spite of the pressure of daily war in the air, the RAF has adhered substantially to the tried and tested method. In spite of the national armament emergency, the Army has done the same.

The RAF has had, however, to reduce its elementary, intermediate and advanced section hours to 50 each instead of the 60 to 70 in the United States, and to nine weeks instead of 10. On the other hand, British pilots receive a further 40 hours of training in actual combat machines with tactical squadrons before they are sent into action—at least they did before Hitler's blitz turned the heat on. This 40 hours was more than the equivalent of the five-week, 30-hour specialized drill just telescoped by the Army into the rest of the American course.

If the British have had to reduce or eliminate this stage, they will certainly have to restore it with the coming into service of the super-fighters now in production. They will probably use obsolescent fighters (300 m.p.h. ships) as a fourth, advanced-plus training type. If the Army has not already taken steps in this same direction, it is likely that it soon will. The gap between current advanced trainers and ultra-modern warcraft must be filled somehow.

The Nazi *Luftwaffe's* training program is basically the same. More intensive use is made, however, of ground instruction and somewhat less flying time is piled up. The Reich faces no gasoline shortage, but it cannot afford to be generous.

Not only do American cadets receive plenty of flying time, but they are assured careful individual attention and thorough instruction. Throughout the entire program—and this goes for ground schools for mechanics, navigators and bombardiers as well as pilots—there is an instructor for every 10 students. Civilian students, CAB or otherwise, must generally share their instructor with up to 20 others.

In order to attain its goal of 12,000 pilots a year, the Army must have 2,160 acceptable new candidates every month —240 from each of the nine corps areas. This figure was not reached during the last few months of 1940. In October the total was 1,974; in November, 1,337. Only one corps area, in the southeast, passed its minimum.

Several explanations have been offered for this failure. The Army inclines to the belief that educational requirements are too high. Two years of college, or its equivalent, are required. Mitchel Field "equivalent" tests have been failing 90 per cent of those not showing college records. There is talk of lowering the educational requirements. Rejections for physical reasons, on the other hand, are also extremely high—at least in the New York area. But there is no talk of lowering these standards.

For every pilot there are 10 others in the Air Corps. For every man in the air, there are five on the ground. Planes, instruments and arms must be maintained and supplied—and it takes an army to do that. In order to keep up with the rest of the Air Corps expansion program, 54,000 groundsmen must annually complete training. As in the pilot training course, civilian schools are being utilized. The period of study depends on the skill being acquired. A 'chute rigger takes only eight weeks, other technicians up to 24. A really finished mechanic, as a really finished pilot, is not produced in less than a matter of years. Therefore, the Army is accepting for these branches of the Air Corps only volunteers signing up for three years.

Navigators, observers and some other flying specialists, are secured primarily from the ranks of the flying cadets who have failed to make the grade. In some of these fields civilian facilities are being used for instruction. In the highly specialized field of overwater navigation, the Army taking advantage of Pan American's crackerjack navigation school at Miami, organized by Panam to train its own personnel for the exacting requirements of its far-flung routes. Eight hundred and fifty will have run through this course by the end of 1941. The Panam course lasts about 10 weeks.

This has been thus far merely a description of the way in which the Army Air Corps is teaching its growing personnel their individual skills. An air force, however—particularly today—is a good deal more than the sum of its individual skills.

Bombardment crews must learn to work together, coordinating the jobs of flying, navigating, bombing, defensive gunnery and other activities into a smoothly functioning team. English experience teaches that it takes a year before the three to 10 men in a bombardment ship work so well together that they can virtually read each other's thoughts. There is no time to write a letter to your teammate in the heat of battle. Pursuit pilots must learn to cooperate closely with other members of the anti-bomber defense organization—such as the antiaircraft artillery. Observer and pilot in the reconnaissance plane must learn to work as one.

The task of coordination does not end here; in fact, it has scarcely begun. The first lesson of modern warfare is the welding of all arms into an effective instrument for defeating the enemy. The Germans have taught that planes, mechanized land forces, artillery, motorized infantry and even warships must strike as one. Different arms will predominate

PILOTS WHO CAN SEND AND RECEIVE **CODE**

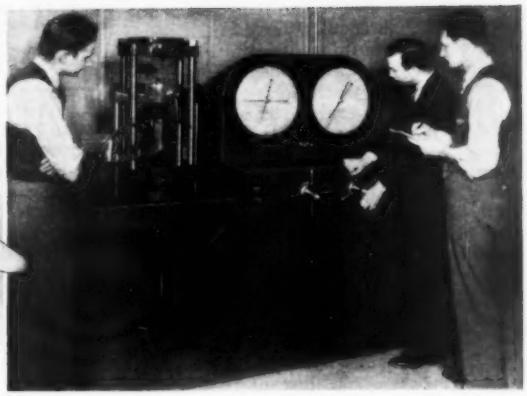
Are of more value to commercial aviation and to Uncle Sam. Army pilots must be able to send and receive 20 words per minute. LEARN NOW! The **Instructograph Automatic Code Teacher** and our complete book of instructions afford the quickest, easiest and most practical method of learning the code that has yet been devised. The **Instructograph** is a scientifically constructed machine, enclosed in an attractive leather case, that literally takes the place of an operator-instructor. Anyone can learn to receive and send code perfectly without further assistance. Ideal for beginner or advanced student—a large variety of tapes are available ranging from the alphabet to typical messages on all subjects. With **Instructograph's** 5 to 40 words-per-minute variable speed range, progress comes easily and naturally.

YOU CAN BUY OR RENT

The **Instructograph Code Teaching Machine** can be bought outright or rented on attractive easy terms. All rental payments may be applied on the purchase price should you decide to buy the equipment. Start learning the code now the fast, easy, practical way—with an **Instructograph. Write** today for prices and full particulars.

INSTRUCTOGRAPH COMPANY

DEPT AP 4701 SHERIDAN RD. CHICAGO ILLINOIS



at

STEWART TECH
IN NEW YORK

In Aviation ... America's Top Industry ... Stewart Tech Graduates Are Leaders

You owe it to yourself to obtain your Aeronautical training in a fully accredited school of enviable reputation. We believe that STEWART TECH is unexcelled in the *quality* of its *instruction*, its *equipment*, its *type* of *student* and its percentage of *graduates* occupying responsible well-paid positions in the Aviation Industry.

Specializing in AERONAUTICS for the past twelve years this School offers the following Government-Approved Courses leading to "A" and "E" Mechanic Ratings:

AIRCRAFT MASTER MECHANIC (A & E)
AIRCRAFT MECHANIC (A)
AIRCRAFT ENGINE MECHANIC (E)

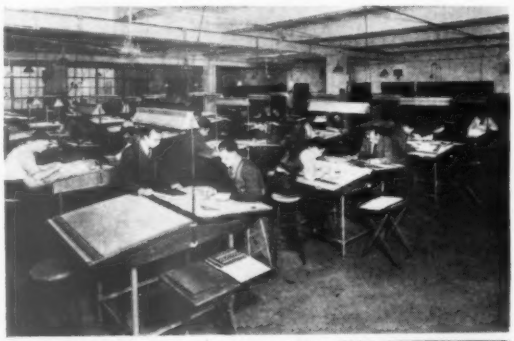
These courses have successfully prepared hundreds of men for Government ratings.

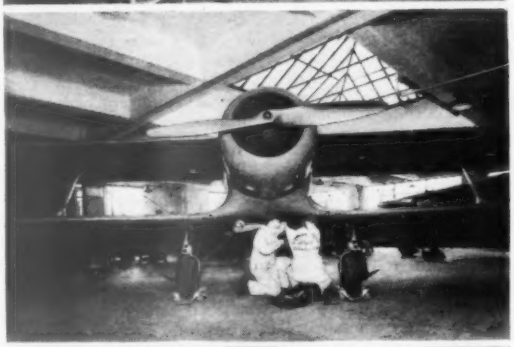
Other Courses are available in:

AERONAUTICAL DESIGN
AERONAUTICAL DRAFTING
AIRCRAFT SHEET METAL & ASSEMBLY

Graduates of all these courses are now employed by leading Aircraft Companies throughout the U. S.

Entrance requirements include High School education or equivalent. For full information regarding courses call or write, stating age, education and course preferred.





SCHOOL OF AERONAUTICS
STEWART TECHNICAL SCHOOL
FOUNDED IN 1909 • SPECIALIZING IN AERONAUTICS SINCE 1929

DEPT. 125 STEWART TECH BUILDING
253-5-7 W. 64th Street · New York, N. Y.

at different times, but to the effort of the whole all are equally important.

Among other things, tactical bombardment squadrons (dive- and attack-bombers, which are really long-range battlefield artillery) must drill with the armored forces they will serve. Short range observation groups must obviously practice with the troops whose advance they will scout and the artillery whose fire they will range.

National Guard divisions in the Army are assured their cooperating scouting squadrons by having them attached directly to each division headquarters. The regular Army's need for bombers and scouts that are part of the team is to be met in different fashion. Squadrons of bombers and scouts needed by the Army will be supplied by the G.H.Q. Air Force. They will be equipped, trained and maintained by the G.H.Q. Air Force and will be part of it, but will be detached and placed under Army divisional command as required. More than occasional practice of this kind will prove necessary for good coordination.

The Army has had set for it a gigantic task—the completion of this vast program in 23 months. Hitler and England both took longer. But this emergency job is no greater than that facing the other armed forces, the regular Army, the Navy and the Naval Air Service.

END

Canadian Production

(*Continued from page 30*)

British government with a Canadian airplane manufacturer.

While the 360 planes a month which will be turned out in a few months from now is by no means the extent to which the Canadian industry can expand, it is a better showing for the industry than was thought possible earlier this year.

END

AVIATION
Needs *You*

AU ACCREDITED

For 12 years, A. U. has successfully prepared men for Aviation. We have an outstanding reputation in the industry for supplying excellently trained, highly skilled graduates.

ACCREDITED by the United States Army Air Corps . . . by the Illinois State Board of Education . . . and listed by the United States Office of Education.

The U. S. Civil Aeronautics Board has certified Aeronautical University for Mechanical Training.

Send for free illustrated Bulletin describing courses in:

Aeronautical Engineering
(B. S. Degree)
Certified Mechanics
Drafting Administration
Special Metal Fabrication Course
Day and Evening Classes Now Forming

AERONAUTICAL UNIVERSITY
(Founded by Curtiss-Wright)
Contractor to U. S. Army Air Corps
Curtiss-Wright Bldg., Dept. PA,
1338 S. Michigan Ave., CHICAGO, ILL.

The Army . . .

(*Continued from page 34*)

2. A cubic foot of iron (Specific Gravity = 7.69) is suspended from a scale and immersed in water. What is the reading of the scale?

3. A bank of seven 100 watt bulbs is connected in parallel. What current flows to the bank when the line voltage is 110 volts?

4. A bomb is released from 8,000 feet above the target. How long does it fall and what is the velocity at impact? Use "A equals 32 ft./sec./sec."

5. *a.* What is the absolute temperature of plus 10° C?

b. of minus 10° C?

c. Convert 30° C to Fahrenheit reading.

ARITHMETIC.

The book here is Wentworth's "Higher Arithmetic." In this section, not only the guinea pig but the author also got 100 per cent on a trial run.

1. Compute by decimals (to three places) the value of

$$\frac{\frac{5}{7}+\frac{4}{9}+\frac{2}{3}}{\frac{6}{7}\times\frac{4}{11}}$$

2. Simplify: $\frac{\sqrt{279 \times .248}}{7}$

3. Divide 105 into the proportion of 5, 7, 9.

4. An airplane used 90 gallons of gas in two hours. The amount used the second hour was 5 per cent greater than the amount used the first hour. How much was used each hour?

5. What is the diameter of a cylindrical tank 12 feet high holding 300 cubic feet?

GEOMETRY.

Wentworth's "Plane Geometry" or any equivalent book is recommended. This subject was given in three parts. The first consisted of 18 questions, each one with four suggested answers. The candidate selects the correct answer from among the four given. Here are six typical questions from Part 1:

1. A closed curve lying in a plane and such that all its points are equidistant from a fixed point in the plane, is called a: square? circle? triangle? rectangle?

2. The locus of a point ¼ inch within the circle described about a given point 0 with a radius of 3 inches is a circle with a: radius of 2 inches? radius of 2½ inches? diameter of 5 inches? diameter of 5½ inches?

3. A geometric figure having been drawn on the examination paper, the candidate is required to identify it; tell whether it is a trapezoid, trapezium, rhomboid, parallelogram, etc.

4. The line which joins the mid-points of two sides of a triangle is equal to: half the third side? one fourth the third side? perpendicular to the third side? twice the third side?

5. The lines joining the mid-points of the sides of a square, taken in order, form: a hexagon? a pentagon? a triangle? a square?

6. An inscribed angle is measured by: the intercepted arc? twice intercepted arc? one-fourth intercepted arc? half intercepted arc?

In the second part of the geometry exam there were three questions:

1. From a given point on a given line, draw a line making an angle equal to a given angle.

2. Circumscribe a circle about a given triangle.

3. Through a given point on a circle, draw a tangent to the circle.

The third part consisted of 10 questions; five typical ones being given below:

1. If four quantities are in proportion, they are in proportion by ....

2. The circumference of a circle is equal to twice the radius times .....

3. The perimeters of two similar polygons have the same ratio as .....

4. In a right triangle the line joining the vertex of the right angle to the midpoint of the hypotenuse is equal to .....

5. If the number of sides of a regular inscribed polygon is indefinitely increased the perimeter approaches .....

ALGEBRA.

The examination will require a knowledge of algebra as covered in Hart's "College Algebra" or an equivalent text. The author's try-out man said he had most of these problems in high school—but he got only 75 per cent on this subject. Carelessness in *arithmetic* lost him many points. Which gives a hint to the candidate taking this exam—use all the time they give you in checking your work. It might mean the difference in going to flying school pronto or waiting three months until you can take a reexam. Ten questions are given in this subject, five typical ones being:

1. Solve for "x," and check your answer:

$$\frac{2x-3}{4}+\frac{x+1}{6}=\frac{5x+2}{12}$$

2. Find by any method of elimination, the values of x & y in the following pair of equations:

$x - y = 4$
$4y - x = 14$

3. A man is five times as old as his daughter and three years ago he was eight times as old as his daughter was then. What are their present ages?

4. Simplify each of the following expressions by removing all signs of aggregation and combining terms wherever possible:

a. $x - (y - 2)$
b. $5a - 2b - (a - 2b)$

5. Multiply as indicated, first rearranging where desirable:

a. $(3a^2 + 2a - 4)\ (5 - a)$
b. $(x^2 + 2xy + y^2)\ (x + y)$

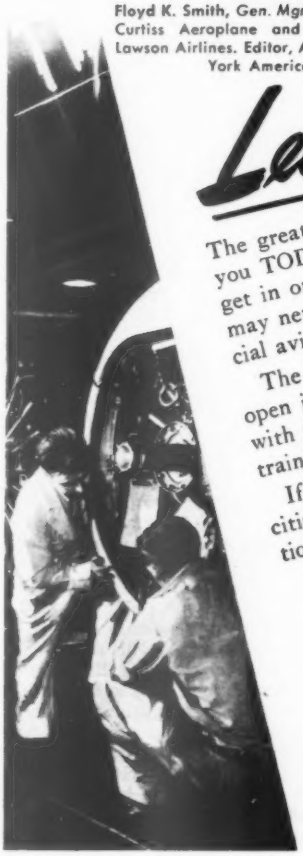
TRIGONOMETRY.

Here's the last subject, such as you'd find in Wentworth's "Plane Trigonometry and Tables." In this exam, a table of natural functions is furnished the candidates. In a previous exam, there were five questions:

1. In an isosceles triangle the equal

YOU can become a part of this great industry!

Floyd K. Smith, Gen. Mgr. Formerly with Curtiss Aeroplane and Motor Corp., Lawson Airlines. Editor, Air Topics, New York American.



Learn Aeronautics

MAIL THIS COUPON TODAY

The greatest opportunity of your life-time exists in AVIATION for you TODAY. There has never been such an opportunity for you to get in on the ground floor of this fast growing industry and perhaps may never present itself again. Make a place for yourself in commercial aviation NOW.

The Chicago Air College will train you for the many positions now open in the aircraft industry. Training given under rated instructors with modern equipment in our recognized school of aeronautics. Your training determines your income and future in this fast booming industry.

If you are sincere, between the ages of 18 to 35 and an American citizen, mail this coupon for catalog describing our courses of instruction. DO NOT DELAY but mail it TODAY.

CHICAGO AIR COLLEGE
1240-42-44 Lawrence Avenue
CHICAGO, ILLINOIS
Chicago The New Air Center of U. S. A.

New Short Term Courses for Factory Production.

CHICAGO AIR COLLEGE
1238 Lawrence Avenue
Chicago, Illinois

Please send me your catalog covering courses offered by your College. I am primarily interested in:

- ☐ Commercial Pilot
- ☐ Private Pilot
- ☐ Aircraft Drafting
- ☐ Aircraft Mechanic
- ☐ Aircraft Engine Mechanic
- ☐ Aircraft Welder
- ☐ Aircraft Sheet Metal
- ☐ Aircraft Instruments
- ☐ Master Mechanic

Name..... Age.....
Address.....
City..... State.....

sides are each 305 feet long and the corresponding equal angles are each 64°. What is the altitude of the triangle?

2. Given a right triangle with one side (*not* the hypotenuse) equal 35 feet and one angle equal 33°. Find the length of the other two sides and the size of the other acute angle.

3. A ladder rests against the side of a building and makes an angle of 28° with the ground. The foot of the ladder is 20 feet from the building and on the same horizontal plane as the base of the building. How high on the face of the building does the ladder reach?

4. *a.* Find the angle whose tangent is .4564.

b. Find the tangent of 48° 27 min.

c. In a right triangle ABC, "c," the hypotenuse is 25 feet, "a" is 15 feet, "b" is 20 feet. What is the sine of the angle opposite "a?" What is the cosecant of that angle?

5. A square is inscribed in a circle whose radius is nine inches. What is the length of the sides of the square?

Well, reader, did you give yourself a tryout on all the above? If so, how did you make out? Think you can qualify, mentally, for Army Flying Cadet? Think the Army is too strict, sets too high a standard?

Well, here's *their* side of it. The pilot must have the ability to absorb rapidly and thoroughly many kinds of instruction. Soon after he leaves Kelly Field he's going to be a commander of an airplane, a flight, a squadron and on up the line, perhaps. As such he'll have to tackle many a tough problem of ballistics, navigation, engineering, administration—to name a few of the headaches of the average air commander. The Army wants to be assured that the lad they are training as a pilot has the mental capacity to absorb the instruction given him during the flying course and later during his active duty tour in a combat unit.

"Many young Americans" said a spokesman of the Air Corps' intelligence division "enlist as privates in the regular Air Corps and study for the flying cadet entrance exam. Should they pass the physical and mental exams, they are admitted forthwith as flying cadets. They do not have to serve the rest of their three years in the ranks. Others have attended 'prep' schools privately developed by Junior Chamber of Commerce groups in various parts of the country. At present, such 'prep' schools are in operation in the Second Corps Area, which takes in New York, New Jersey and Delaware, and in the Fifth and Sixth Corps Areas which take in Ohio, West Virginia, Kentucky, Indiana, Illinois, Wisconsin and Michigan.

"Will the Army ever lower the educational standards for flying cadet? Perhaps, if it is absolutely necessary—but very reluctantly. Look at it this way: isn't that pair of wings, that commission as a flying officer, that extended active duty with the Air Corps worth studying for? Thousands think so. They're the ones who are burning the midnight oil so they can later burn the 100 octane stuff in a fighting ship."

END

FORSYTHE
TRAINS MEN FOR
AVIATION

WANTED, at once, trained production men—riveters—welders—sheet metal workers—aircraft mechanics—assembly men—office workers.

Jobs by the thousands are open now in booming aircraft factories. Opportunity of a lifetime to qualify for quick advancement and better pay. Big demand for Forsythe trained men. Inexpensive courses. Write for descriptive folder.

FORSYTHE AIRCRAFT SCHOOLS
★ VAN NUYS, CALIFORNIA ★

Airplanes—Stay Away!

(*Continued from page* 43)

his dusting plane over nearby bean fields. That night I stayed on the porch of his shack, was treated with some real "cracker" hospitality and had grits and sow belly for breakfast. He had me up at the crack of dawn the next day, with the rain still coming down and the weather unusually cold for Florida. "Too wet to dust," he said. "Let's do a little deer hunting." Well, I never was a hunter but welcomed anything to break up what was obviously going to be a dull day of being weathered in. I put on my oldest clothes and expected to bounce off somewhere with him in his truck. But I was amazed to see his colored handy man gassing up my *Cub* and taking the cover off the engine. Half aghast, I ventured a meek question of whether he'd like to take the ship around and see how it flew.

"No, I'll do that later," he smiled. "We're going deer hunting in your ship." I gulped a little and gradually learned that the technique would be an aerial deer hunt with me flying and him shooting from the side of the plane, much the same way they shoot coyotes out west. That seemed like a lot of fun util I found out where we were going to look for deer. "We'll just head south for a while and see what we can find." South to me meant nothing but the Everglades. I stammered a bit; I had a terrific vision of all the worst possible things that might happen. I reminded mine host that my ship didn't even have a compass in it. "Don't worry," he said, "leave it to me." I had just had a few good meals from this guy and slept under his roof so I had to be obliging. Off we went, the powerful (?) 40 h.p. single-ignition Continental chugging away in the damp morning air. I started wishing then that I had waited that extra day at the factory for dual ignition. We climbed all the way to 100 feet and headed in a generally southern direction. Twenty miles out and already in the thick of the Everglades, my rifleman allowed as how we'd better get down to 10 feet to see the deer better—hadn't seen anything up until then. From 10 feet the view was quite horrifying. We flew over the saw grass only. Every blade seemed to stick up and try to catch the wheels. Down between them could be seen water, water, and more water, and probably plenty of ooze and slime down underneath. We dodged between clumps of Palmettos, skirted around some higher trees expecting to see the deer we were looking for. Occasionally we came upon a group of cattle, long horned steers, which reminded me more of Texas than Florida. Outside of these and an occasional white plumed bird it was a barren desolate feeling of "goodby to civilization." Forty-five minutes of this still hadn't produced a deer. Occasionally I'd hear the 30-30 crack out at a bird but no results were obtained.

I started to protest. By some uncanny ability my co-pilot had kept me apparently heading south with little variation. I started thinking of my fuel supply, whether we'd be able to return to Pahokee against a headwind without wandering around. The visibility was lousy and it was raining continuously. I frankly didn't like any part of it. As my protests started coming out of my mouth, he interrupted me and said to head a little bit west. "We'll land and have a cigarette!" Land? A cigarette in the middle of the Everglades? I started wondering if this was premeditated suicide. But I couldn't argue. I had no idea where we were, could never get back without his help. In a few minutes we came upon a spot which didn't look like what we'd been flying over. It was darker brown and *dry*. He said to set her down there, so I wheeled around into the north wind and found the smoothest runway under my wheels I had ever experienced. Relief came to me in no uncertain terms, however, when I finally cut the switch and saw both ends of the propeller blades sound and secure. I couldn't help but think what a rather embarrassing situation it would be if we'd wound up in some soft stuff and nosed over. We must have been at least 50 miles from the nearest telephone.

The silence was terrific and awesome. We got out and stretched our legs, lit cigarettes. It was the most real experience of isolation and complete severance from civilization I had ever had. It was almost enchanting and visions of camping out here for several days with a pup tent danced through my mind as the happiest paradise for the tired business man who wanted to get away from it all. I couldn't forget, however, what a broken propeller would do to make things just a little bit inconvenient. I ventured this thought to my guide and heard the worst.

It seems he had made a business of flying hunting parties into the Everglades. There were a few spots such as the one we were on which, during the dry season, were good for landing. Knowing the country like a book all his life, my co-pilot had little concern. I was relieved, if only a little bit, to hear that we were only 25 miles from the Seminole Indian Reservation where some one or

A NEW Name for an OLD School

SWEENEY AVIATION SCHOOLS, INC.

becomes

FAIRFAX AVIATION SCHOOLS, INC.

★ The Sweeney Aviation Schools, Inc., is now known as **THE FAIRFAX AVIATION SCHOOLS, Inc.** No other changes have been made. The management remains the same, the instructors are the same, the courses, with some improvements, are the same. In fact, there is

Nothing Changed

BUT THE NAME!

With rapid expansion of the aircraft industry, the opportunity to find a job and rapidly advance in this fascinating, fast growing field is tremendous. Fairfax training, the same training that has made it possible for hundreds of young men to get started in aviation, is now available to YOU!

Don't wait! Start YOUR training NOW!

Mail the coupon TODAY!

Please RUSH complete information about FAIRFAX AVIATION SCHOOLS, Inc. **PA5**

NAME.....

ADDRESS.....

CITY..... *STATE*.....

Fairfax AVIATION SCHOOLS, Inc.

FAIRFAX AIRPORT — KANSAS CITY, KANSAS

other had a Model T Ford which at times had been known to make a successful trip into civilization. Several years before, my companion had flown two men into a spot close by with a Curtiss *Robin*. He nosed up on the take-off splintering the prop. After a hard trek back, a new prop was ordered and a week or so later he returned to his ship, replaced the propeller. In the meantime, it had rained hard and the high pressure narrow tires couldn't even be budged with much pushing and full power. Frustrated, they trudged back again to the Indian reservation, got back eventually to civilization. As enterprising as the famous Arctic pilots, they got a set of Airwheels and axle adapters and returned to the scene. After much laborious work (a Curtis *Robin* isn't the lightest thing) the wheels were changed—but even then, with the softer cushion of Airwheels, the freshly-soaked turf wouldn't allow anything but slow taxiing. Two miles away was higher and harder ground. After almost superhuman pushing and taxiing, the airplane was taken over to this spot and finally got off. All in all the ship had been in the Everglades for nearly a month. These thoughts raced through my mind and dispelled all pleasant musing of being in such an adventurous spot.

He told me also of a person flying a Bird from Tampa to Miami non-stop (no worse course could be imagined). As it must to all men, the engine stopped miles away from anywhere. The ship came into the soft muck, went up on its nose, broke the prop but did no other damage. Fortunately, the ship was sighted soon after but airport personnel still didn't know what to do. Finally a Goodyear blimp was called in to save the day. It went out to the scene lowered a rope and rescued the pilot. Back at Miami salvage of the airplane was uppermost in the pilot's mind. It couldn't be dismantled and trucked away because man could not walk to or from the scene let alone carry wings, an engine and fuselage. Finally they returned to it in the blimp with a unique cargo—a load of planks! A corduroy runway was laid down into the wind hardly more than a hundred feet long. With a new prop, a good breeze and a lot of luck, the pilot got off and got into Miami safely although a little late.

By this time I was convinced that even Pahokee would look good to me. I couldn't even finish my cigarette in my anxiety to get out of that place. I walked for several hundred yards over the "airport"—this plot of ground between two groves of palmettoes. It all seemed solid, with grass as smooth as a golf green. No happier or freer experience have I ever had than when we finally cleared the ground and were headed north. Like a homing pigeon my hunting companion led us straight to the lake and the friendly sight of his little airport. I had had a wonderful experience but I'll never do it again.

The Everglades, however, should have no effect on any one wishing to fly to Florida. This vast swamp is pretty much off the beaten track. Mainly it lies directly west of Miami but mostly southwest. The only real time a person should get close to it is in going to the Gulf Coast, Ft. Myers, Sarasota, or Tampa from Miami. Even then a slight variation of course will keep you within comparative reach of civilization. The Tamiami Trail is the pilot's byword in crossing the Everglades. This is a modern highway lifted up out of the swamp mud. It goes for 40 miles straight as a die west of Miami, gradually works up toward the Gulf Coast and those resort cities. To build the trail, muck had to be sucked up on either side to form the foundation for the paving. Landings are quite possible on the road as the telephone line is set well back and there isn't a tree in sight for the most part. However, the lad who lands on the trail has to be pretty nimble on the brakes as one slip off the tarred surface puts him into the canal. Several years ago a bus ran off the highway into the muck and killed nearly a score of people. There never has been, in my life, a landmark so reassuring as the trail when I had to cross the swamp.

The Everglades holds many secrets which it never will let go. If you want to avoid the draft, just run out of gas over the Everglades. They'll never find you.

END

Engine Lab

(*Continued from page* 41)

for supercharger research, a vitally important problem now as the war overseas has become a high altitude war, with much fighting going on above 20,000 feet. Anti-aircraft developments are continuing to lift the safe ceiling for war aircraft. Supercharger development, for that reason, is considered one of the most vital elements in military-type engine building.

In his original report to the house committee, outlining the functional objectives of the laboratory, Dr. Lewis went into the following details on the subjects of supercharger research and the recovery of waste heat, which may become closely related:

Immediate supercharger investigation will be based on three types now in considerable use: superchargers driven by engine exhaust; two-speed, gear-driven types; and two-stage types utilizing compressed air in the first stage, which is delivered to the second stage for further compression. These, and the whole field of supercharging, will be given a thorough exploration.

One section of this unit will be set aside for studies on recovery of waste exhaust heat, a high percentage of which now represents energy loss. Some heat waste is now being reclaimed by the exhaust-type supercharger. Further possibilities are offered through the development of gas turbine and jet expulsion methods. Major investigations of this entire problem will be continued.

Perhaps the greatest advance in research facilities to be provided by the new laboratory will be the immense power plant wind tunnel, a unit to cost $3,000,000. It will be something which does not exist anywhere else in the world. The tunnel will have a throat diameter of 25 feet and an air speed at sea level of 300 m.p.h. In it, research on engines up to 4,000 h.p. will be possible. The tunnel can be evacuated to a density corresponding to a 30,000-foot altitude. It will permit the study of complete, full scale power plants under flight conditions, with propeller operating and using supercharging up to 30,000 feet. Thus full operation tests can be made, offering a study of the most efficient combination of engine, supercharger, propeller and nacelle combinations. Research engineers can here get the answer to problems which would require months of flight tests.

Research in the improving of the power output of engines to be used for the present procurement program, now under way at Langley, will be transferred to the new laboratory. In the last 10 years the horsepower of engines has been doubled without increasing the size of the engine. Military airplanes must now fly at speed of 400 to 500 m.p.h. To obtain these speeds the engine power must be further increased without increasing the overall size of the engine. Continual progress is being made in this direction, but it will be carried on a great deal further, as this problem is basic. In this

HIGH SALARIED FUTURE IN AVIATION

A few months intensive study and experience will prepare you for a lifetime of interesting, high-paying work as an Aircraft Instrument Technician. Airlines, Airplane Manufacturers and Instrument Manufacturers need trained instrument experts to install, calibrate, repair, rebuild and design aircraft instruments. Civil Service is also employing aircraft instrument technicians for Army and Navy. Airplane travel and navigation is depending more and more upon instruments for safe, schedule flying.

C.S.A.I. Offers Choice of Two Courses
Six months in day school; 18 months in night school covers complete study. Courses are based on requirements of airlines and manufacturers. Write for catalog and details.

Chicago School of
AIRCRAFT INSTRUMENTS
Dept. FPA-5, Municipal Airport, Chicago, Ill.
Please send me your latest catalog and full details of your aircraft instrument courses.
Name.....
Address.....

AIRCRAFT LITTELFUSES

AIRCRAFT FUSES
(LITTELFUSE)
Anti-vibration — precision made for high and low voltage. Dependable, Accurate. Also instrument and radio fuses, fuse mountings, etc. Write for free catalog.
Littelfuse Incorporated
4793 Ravenswood Ave, Chicago, Illinois

NEW! 1941 MODEL NO Tubes Batteries Pocket Radio Plug in
DURABLE PLASTIC CABINETS
Dual Bands-Magictenna-Microdial
Fits your pocket or purse. Wt. 6 ozs. Small as cigarette package. Receives standard & short wave. PATENTED POWER RECTIFIER. No tubes, batteries. Hi-ratio easy tuning slide "MICRODIAL." M. L. OF ILL. SAYS: "MIDGET RADIO WORKS FINE!" **ONE YEAR SERVICE GUARANTEE!** Sent complete ready to listen with instructions & tiny phone for use in homes, offices, hotels, in bed, etc., SIMPLE TO OPERATE—NO ELECTRICITY NEEDED! **SEND NO MONEY!** Pay postman only $2.99 plus postage charges on arrival or send $2.99 (Check, M.O., Cash) and yours will be sent postpaid. A MOST UNUSUAL VALUE! ORDER NOW! **FREE!** PLUG IN "MAGICTENNA"—ELIMINATES OUTSIDE WIRES! **MIDGET RADIO CO., Dept. HG-5, Kearney, Nebr.**

Study IN THE HEART OF AMERICA'S AVIATION INDUSTRY

Good Paying Jobs Await PIA Graduates

Preparedness is the keynote of America's fastest-growing industry—Aviation. Are you prepared to take your place in this fascinating and high-paying field? Hundreds of P. I. A. trained men are now employed in key positions throughout this ever-expanding industry. Many are well on their way to financial independence and success.

Your opportunity to get into Aviation depends largely on your training. Pittsburgh Institute of Aeronautics offers you over twelve years of proved, practical instruction—expert, government licensed instructors—a $1,500,000 Airport of over 185 acres with 50,000 square feet of building facilities plus complete and modern equipment.

You get mechanical training on "live" airplanes and the opportunity of witnessing the results of your work in the skies. P. I. A. is the only government approved school between St. Louis and New York providing complete courses in airplane engine mechanics and flight. P. I. A. training eliminates non-essentials, prepares you in accordance with the requirements of the nation's leading aviation firms in the shortest possible time. Act now—fill in and mail the coupon today!

MAIL THIS COUPON TODAY!

AUGUST G. BECKER, Director
PITTSBURGH INSTITUTE OF AERONAUTICS
Aviation Building, Pittsburgh, Pennsylvania

Without cost or obligation please send me full information on the courses checked.

- ☐ Aeronautical Engineering
- ☐ Aircraft Master Mechanics
- ☐ Aircraft Sheet Metal
- ☐ Instruments and Radio
- ☐ Aircraft Welding
- ☐ Airline Procedure
- ☐ Control Tower Operation
- ☐ Aircraft Drafting and Design
- ☐ Meteorology
- ☐ Aircraft Mechanics (Home Study)

Name..... Age.....

Address.....

City..... State.....

PA-2

PITTSBURGH INSTITUTE OF AERONAUTICS

"AMERICA'S FINEST SCHOOL OF AVIATION"

BETTIS AIRPORT PITTSBURGH, PENNA.

work there is to be a definite tie-up with another laboratory unit, the fuels and lubricants section.

Thus the fuels and lubricants laboratory will be important in the functions of the new research center, because of its relation to unit power increase investigations and because of the work to be carried on in the construction and development of instruments required in connection with the measurement of fuel-air ratios and engine operating conditions to determine actual operating conditions for maximum efficiency and safety.

There also will be an exhaustive study of safety fuels and the use of fuels of this character with fuel-injection systems—and a complete exploration for new and better fuels and new and better lubricants for high-power output.

Because of its simplicity and relatively low cost the importance of the engine torque stand unit is apt to be overlooked. But it is a vitally important section. Consisting chiefly of a horizontal intake appratus and a vertical exhaust, it will give the answer to a great many questions, some of which are fundamental. After previous engine tests have been completed, torque investigations will be made, combining engine and propeller. This work also can be carried on up to 4,000 h.p. Studies will be made here of ground conditions affecting supercharging, cooling, vibration characteristics of the whole power plant and the stresses upon engine parts.

This work is tremendously important in the face of efforts to get stepped-up power out of a given-size cylinder. Metallurgy enters into these research phases. Efforts will be pursued to find better metals; metals that will be able to withstand these greater stresses.

The hangar and flight test section will comprise a brick and steel hangar, with special equipment such as a thrust balance for ground adjustment and check of factors affecting power plant thrust; special equipment and facilities for exchange and overhaul of aircraft engines; cooling-blower equipment for ground operation of installed engines over a period sufficient for check of new devices before flight. In the last analysis the results of single and multi-cylinder investigations must be a final check in flight. The hangar and equipment are necessary for this purpose.

At the moment that actual ground was broken for the first building by Maj.-Gen. George H. Brett, acting chief of the Army Air Corps, contractor's equipment was standing by ready to start work on the project, with the construction schedule calling for full completion within the year. General Brett's comments at this moment are interesting:

"Much has been said about quality as opposed to production. England has maintained quality as against production. A comparison of the air casualty rates of Britain and Germany revolves around the question of quality. Quality is built on research.

"The War Department asks the greatest cooperation from the citizens of Cleveland in seeing that this research laboratory accomplishes its mission."

That all functions of the new laboratory are aimed at speeding production of airplanes for our own defense and that of Britain none will deny, but there is another thought to keep firmly in mind: some day the emergency will end. When that day comes, after proper celebration, aviation can go back to its normal problems. This can be done with the knowledge that great strides have been made in this laboratory in the interim—developments that gill give commercial and civil aviation new ships—and engines of which the industry would not dare dream. At the moment this may be by-product, but at the proper time commercial aviation in this country will emerge from a period of forced restraint which will carry it to quick new heights.

It is interesting to note the activity in Cleveland industry since the announcement of the laboratory's location. There is more than coincidence in the enormous plant expansion schedule for 1941. Thompson Products, Inc., for instance, will rush to completion a new 575,000 sq. ft. plant, to cost $11,000,000. The Cleveland Pneumatic Tool Company is under way with a $5,000,000 expansion and the Ohio Crankshaft Company plans similar expansion.

General Motor's Fisher body plant will be turned to aircraft production and United Air Lines has made application for a new route connecting Cleveland with Boston and Hartford, Conn., to cut two hours off the flying time on this trip which is now routed through New York.

Plant expansions for 1941, announced in the month of January alone, are greater than the entire year of 1939 and two-thirds of the 194 total. The figures at the moment add up to 1,213,000 square feet, with further additions expected throughout the year.

END

Night Solo

(*Continued from page 49*)

has struck a match down there, but it doesn't flicker. Sure wish I could take an elevator—well, here goes. I turn in toward the hangar line. Now for the merry-go-round. Altitude—yep, 500 feet. Motor turning up about 1,800 r.p.m. I cross the field boundary lights, cut my gun, settle into my glide. Air speed 85. Silently 272 swings around the last turn and drops toward the lights. They're brighter now—more reassuring. Time to let down a couple of turn of flaps. A little steeper glide now. Keep that air speed up to 85. Altimeter shows 100 feet. Time to locate that ground. There she is. Coming up too fast though. Start leveling off some. Now a little more. Hold her off. Hold her off.

That voice again, as if in echo begins to chant: "Hold her off . . . Hold her off . . . get your tail down . . . get it down." Whereinhell did that ground go? It ought to be there. I can feel myself reaching, every fibre in me reaching, straining, feeling, grasping for dear ole terra firma. Suddenly a reassuring jolt. It was there all right. Hit wheels first and bounced. How high? I'm feeling again, but this time not for long. With a mighty satisfactory thud I drop to the ground, this time for good. A feeling of exhilaration surges through me. I'm down, but that's not all. I've been the round trip. I've disappeared into the night and I've come back out of the night—and I've done it alone.

But it's no use—there's that man again: "Go back to your zone, 272, and the next time you land don't try for the broad jump record." Somebody ought to feed that guy ground glass . . .

END

Rev Them Carefully

PILOTS should be careful in revving up airplane engines lest sand or gravel be sucked up into the propeller, Aero Insurance Underwriters engineers warn. This causes nicking and scuffing of the blades. It is suggested that, when revving up an engine, it be done on a surface free from gravel. On take-offs from sandy or gravel areas the "sand blasting" effect can be reduced if the pilot will open the throttle slowly so that the increasing forward speed will counteract the suction from the increasing r.p.m. This also lessens the chances of damaging tail surfaces by showering them with gravel—but those who adopt this system should be sure they have enough take-off distance before adopting the slow-throttle take-off.

AVIATORS!
IDENTIFY YOURSELF WITH THIS BEAUTIFUL PIN

(Actual Size)

We are offering this pin and our illustrated aviation catalogue both for 25c — or send a dime and get the catalogue! Aviator's Personal Equipment, Novelties, Clothing, Jewelry, Books on Aviation, Aviation Insignias, etc.

(*Thousands of these pins have sold for 50c*)

JOHN KEANE, 18 HARVEY ST., PHILA., PA.
Enclosed is 25c. Please send me that beautiful pin and FREE catalogue.
NAME .....
ADDRESS .....
CITY..... STATE.....

AIRCRAFT INSTRUMENT

INSTRUMENTS
RADIOS • ACCESSORIES
NEW • USED

Finest products • reasonable prices • fastest service • all work guaranteed • write for quotations.

U. S. approved repair station No. 318
AIRCRAFT INSTRUMENT SERVICE, INC.
DETROIT CITY AIRPORT DETROIT, MICHIGAN

SPOT-SIGHT
ACCURATE SPOT LANDINGS MADE EASY WITH THE METZLER SPOT-SIGHT
Send $6 for one, for use with light planes. Specify type of ship which you fly.
SPOT-SIGHT COMPANY, 2142 Wyandotte, Lakewood, Ohio

I Learned About . . .

(*Continued from page* 39)

Tucson, where we attended an air meet. Early the next morning we flew to Phoenix. We landed at the municipal airport there, took on a load of gas and prepared to go over the hump to Winslow. I sought out Carl Kineer, the Taylorcraft man there, and asked him about the flight—which was the smart thing to do.

"What's your course?" he asked.

"We're flying compass," I told him. I showed him the map, with our course line on it. Byers and I had done some careful figuring.

"Don't fly compass," Kineer warned. "You're carrying a heavy load, in the first place. Those dark clouds hanging around the mountains to the north are snow clouds. You'll have to cross 8,000-foot mountains if you do that. You're carrying a very heavy load. I'd say that you'd probably ice up your carburetor."

Byers checked the airlines office and was told:

"There's snow up there. You'd better be safe and hang around here until she clears."

When Kineer heard that he told us that he agreed with the airlines—it was risky business.

"Thanks," we said and headed for our ship. Kineer followed us, told us that if we had to get to Winslow we'd better fly a special course. He took our map, showed us how to fly 30 miles up a canyon he indicated, turn left at an abandoned ranch. We'd probably miss snow, he said, and a lot of other troubles.

So we took off. We tried to find the canyon and couldn't. We didn't locate the ranch either. We should have come back. But, no. We decided to go back onto our compass course, making a five-degree correction for the position we thought we had, and started out for Winslow.

"We should worry," I told Byers. "You can set a light ship down any place."

Well, the country looked pretty flat on the map. But it wasn't. We soon bumped into mountains with clouds down on their peaks. Frankly, we never saw the top of a mountain during the ensuing trip. We had scheduled the flight for 1 hour and 40 minutes. It shouldn't take long to get over a few hills—

We didn't want to get out of sight of land. It was to be contact. So we started looking for passes low enough so that the clouds weren't right down on top of them. We found the first one by shifting our course about 10°. We found the next one by shifting our course about 15° in the other direction.

Pretty soon we were just like Columbus. We didn't know where we'd been, we didn't know where we were going and we didn't know where we were. All we knew was that somewhere, in a general sort of direction, the mountains ended and there would be desert.

One by one, Kineer's predictions came true. He knew the country, we didn't. After about an hour out the carburetor started icing. It made the motor rough, we lost revs and had to dive wide open to clean it out. This was all right until it started icing while we were at 8,000 feet, our service ceiling with the load we carried—and we still had to dive to clear it. Our dives were shallow, believe me. We were at times between 75 and 100 feet above the terrain. And there was, as Kineer had predicted, no place to sit down and talk things over by a nice warm fire. There wasn't even a place to set down.

Blocked in one spot, I made a 720° power turn. When I levelled off, the compass stayed in the bank. It was out of the running. It took 10 minutes of pounding, warming and nursing it before it came down to normal position and started functioning again. This situation remedied, we plugged onward. Then another one of Kineer's predictions came true. It started to snow. Visibility dropped. We weren't sure whether we could stay contact and still clear the humps. But we *did* know that if we went up into the overcast our next contact would be nose first—and they'd find us along in the spring.

Frankly, with 16 years of flying behind me, I was in the tightest spot I'd ever been in. I was scared and worried. I'd flown ships practically into the ground while cameras had turned; I'd flown 150 miles to sea in a landplane to get cloud shots and I'd tested brand new prototypes that had never been flown before. But I'd never been on the hot seat like this.

Sometimes we were at 8,000, again at 9,000 feet as we used gasoline. One hour went into two and we were still in the

If you're going to get into Aviation, get into it RIGHT. Take the kind of training that prepares you for a **life-time career in Aviation** . . . not just an emergency job. This Lincoln Government Approved School offers you . . .

CAREER TRAINING in
- Aeronautical Engineering
- Maintenance Mechanics
- Professional Flight

MAIL COUPON TODAY

3 BIG CAREER COURSES

AERONAUTICAL ENGINEERING—a 2-year course that provides wide, practical experience in Airplane Design and Construction, preparing for a high-pay, responsible position as Aeronautical Engineer.

AIRPLANE MAINTENANCE MECHANICS—a 1-year Government Approved Mechanics Course that prepares graduates for Government rating as A & E mechanics and profitable employment with airlines and airport operators. Big demand for these graduates.

PROFESSIONAL FLIGHT TRAINING—a Government Approved Course, preparing for commercial pilot rating. Also special training given, preparing for a Flight Instructor rating. Big Pay—Big Demand.

WRITE this Lincoln School today for complete information.

Please rush complete in.ormation about Lincoln's Career Course in Aviation.

Name.....

Address.....

City..... State.....

LINCOLN AERONAUTICAL INSTITUTE, INC.
LINCOLN AIRPLANE & FLYING SCHOOL DIVISION
TEACHING 20 YEARS AVIATION

135 AIRCRAFT BLDG., LINCOLN, NEBR.

mountains, somewhere in, or over, Arizona. The job was constantly to stay above terrain, sight holes which would let us through passes. I've often thanked the powers that be that there was no wind, no hot dry air, for we would never have got the altitude we had to have, probably would have washed out heading up some canyon up-wind.

On this flight I did learn one thing which I will list under a sub-title: If you ever fly in the west and get lost over mountains, do *not* start circling. If you do, you'll *stay* over them. If you pick a compass course and stick to it, you'll eventually fly out of them. It's the same principle as *not* walking in a circle when you get lost in the woods.

We should have been over the desert in about an hour. After two hours went by, we were still hunting passes with gaps between them and the clouds, still flying through snow flurries and our carburetor still was icing up. We passed three deserted ranch houses, found no place to set down and couldn't find them on our chart. At the three-hour point, I began to worry about gasoline. The supply was getting pretty low. We'd changed our course so many times skipping through passes with our wheels right down on the pines that a compass heading only had a general meaning.

George and I talked for a while, then finally we didn't seem to have anything to talk about. The sky got darker, the going got worse and we began to run through clouds for a hundred yards at a time. I began having visions of stacking, recalled what I had said about being able to "land a lightplane anywhere."

Just when I was beginning to wonder if searching parties would be able to find us when the snow melted, the sky began to lighten. This time we got a happy surprise. We burst out of the mountains and trouble all at the same time. The sun came out, the overcast melted away and the desert lay stretched beneath us.

"Now we *can* land any place," I told Byers. He just looked at me.

Far off to our right we spotted Winslow. We discovered that we were many, many miles off course, flying down the mountains toward the northwest, heading for San Francisco peak, towering like a volcano. I turned around without losing any time, headed for Winslow, set the ship down and called for gas. The tank took 16 2/3 gallons—meaning that we had just a little over a *quart* in reserve.

Since that first unhappy experience—for which I was entirely to blame, not the airplane—I have flown hundreds of hours over all kinds of terrain and have had a lot of fun and an increasing faith in and appreciation of the performance of the lightplane. I have never had a motor quit on me and I have never had a forced landing. I have flown in all parts of the United States.

But every place I go, if there is the least bit of doubt about the country, the weather and its habits, I proceed to ask questions. Once I've learned the facts, I am guided entirely by them and, if the local pilot out of the goodness of his heart tells me he thinks I ought to stay on the ground, I *stay*.

I know that he isn't playing Mr. Gloom, or that he isn't faint-hearted. He's a smart guy who knows what he is talking about.

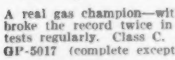
That, I'm sure, explains my happy record of trouble-free trips in light airplanes.

END

Build the Models that Will Be HEAVILY in the WINNINGS in 1941

Playboy, Sr.

A real gas champion—with it Bill Schwab of Cleveland broke the record twice in a week. Others winning contests regularly. Class C. Huge 80" span. Kit GP-5017 (complete except power unit) only... **$3.95**



New ¾" War Planes

Spitfire. Kit SF-73.....$2.50
Messerschmitt Me-109 (shown above). Kit SF-74.....$2.50
Skyrocket. Kit SF-75.....$3.00
Airacobra. Kit SF-76.....$2.50

46" Playboy Jr. "B." Kit GP-5006....$2.50
33" Baby Playboy "A." Kit GP-5008....$1.00

Catalog 5c

Featuring all 90 of "America's FIRST LINE of Flying Models." Authentic scale, contest models, gas, nature models, gliders, etc. 25c up. Also parts and supplies. Send only 5c for your copy NOW.

Also Ship Catalog 5c, and R.R. Catalog, 5c.

CLEVELAND MODEL & SUPPLY CO., INC.
4508A44 LORAIN AVE., CLEVELAND, OHIO, U. S. A.

"G" LINE FLYING
Sensational - New - Thrilling

THE BABY SHARK
Newest "G" Line Sensation
Designed for all Class A & B Motors, the BABY SHARK flies at tremendous speeds of from 50 to 75 M.P.H. Amazingly Stable in Flight.
COMPLETE KIT, Only $1.98. Postage 25c
Illustrated Descriptive Folders 5c
VICTOR STANZEL & CO.
Schulenburg, Dept. P, Texas

AVIATION APPRENTICES
AIR-MINDED Young Men interested in training for entering the well-paid field of aviation as Apprentices. Write immediately, enclosing stamp.
MECHANIX UNIVERSAL AVIATION SERVICE CO.
Wayne County Airport, Box 857, Dept. BS, Detroit, Michigan

GOOD PAY
Learn POWER PLANT ENGINEERING
Trained men in big demand! Course by Factory Engineers. Low Tuition. Terms. Keep job while training. Write Today.
FREE Booklet
WESTWOOD School of Aeronautics, Inc.
514 Village Station, Los Angeles, Calif

AOPA News

(*Continued from page 54*)

to all licensed pilots in the State of Iowa. It is self-explanatory. It seems strange that within the period of a few weeks New York, Texas, and Iowa have all blossomed forth with state legislation of a suspiciously similar nature—all the more warning why we must keep our eyes open and ears to the ground. The full text of the letter follows:

"Mr. Pilot: Please read the following very carefully. It concerns a matter which is of vital importance to you and all other pilots flying in the State of Iowa. Your flying costs may be greatly increased!

There is pending today before the Iowa State Legislature two bills which will provide, if passed, for the termination of the 3c refund on aviation fuel to which you are now entitled. Over a period of a year this will amount to a considerable increase in your flying costs if you do much flying.

The money so collected is to be used for another attempt at a "State Aviation Commission" in the State of Iowa. Two former "commissions" have been devised in the past and neither have effected any substantial contribution to flying or airport development in Iowa in the opinion of most pilots.

The total receipts from gas tax refund last year amounted to some $10,000. Obviously, since the bill as proposed provides for a salary of $4,800 for the coordinator and $10.00 per diem expense for the coordinator and other members of the commission, the total gas tax collected would be expended on salaries and overhead without providing the slightest opportunity for development of additional airports or facilities. Therefore, you will be paying more for your flying and not receiving any benefit.

Here is a short simple way to effectively voice your opposition to these bills: A clearing house has been set up by the Des Moines Unit of the AOPA to convert your written protest to an effective means of stopping these bills known as Senate Bills 452 and 453.

All you have to do is to write or wire immediately to:

Gas Tax Committee
Des Moines Unit, Aircraft Owners and Pilots Association
Fort Des Moines Hotel
Des Moines, Iowa

expressing vigorously your opposition to Senate Bills 452 and 453.

If *you* are interested in saving *real* money now and in the *future*, we urge you to *stop* these measures now. *WRITE* or *WIRE* immediately—get your pilot friends to do likewise as these bills are scheduled to come up this week.

Very truly yours,
J. B. Hartranft, Jr.
Executive Secretary"

There is even more danger to American non-scheduled pilots in the Texas and New York aviation "black-out" legislation. The great danger is that *other* states may follow suit and bring more pork barrel *fee* legislation. This is the time for us to band together and check this trend which, if allowed to run rampant, *will ground non-scheduled aviation.* Make yourself heard now—before this legislation has passed. Keep alert and active, national, state-wise, and also locally. Local "operation and landing *fees*" must be wtached. Topeka, Kansas, is now considering a local measure to tax fixed-base operators and aircraft owners for the use of the field. Write to your proper representative, keep in touch with the AOPA National Service Office, read your monthly "AOPA Section," and persuade your fellow pilots to register as AOPA pilots!

END

Five Men and a Plane

(*Continued from page 27*)

"The time will come," says Goodwin, "when we'll all have to kitty up for an overhaul or something like that. Wear and tear are bound to take place. There'll be new tires and various other replacements with the ship operating on an average of 150 hours per month. Some of these charges, however, will be defrayed by the fines which we collect."

Just this week, fines paid for a 100-hour check. Johnston, the organizer, handles the financial and operation problems. He collects the monthly dues, makes the payments to the finance company, pays for servicing and storage, collects fines and sees that there are no conflicts in demand for the plane.

What are fines levied for? We've mentioned failure to fill the gasoline tank. Taking the ship out without notifying Johnston's secretary costs a dollar. This fine will be raised if there is too much of it. Dates for the plane must be made well in advance with Johnston's secretary so that no one is crossed up.

"But who," we asked, "gets the preference?"

That offers a new thought and the question is settled automatically. The secretary keeps a record of each member's flying time. If there is a conflict, the man with the lowest number of hours on the ship—the lad who is behind on his share—gets the nod. The lad who has been flying a lot has to step back.

"This," Johnston says, "keeps the boys' time even. Nobody can run wild. For instance, if Goodwin has a lot of time off from shouting about Blondie, Dagwood and Bob Hope and has been getting in a lot of time and Bob Garred has had a lot of production headaches and hasn't been near the ship for a week, Garred is the man who'll fly if both men want to get off the ground at the same time."

Other fines? Sure. Failure to make a thorough line inspection of the ship both before and after flying it, failure to make a record of flight or flights in the log books, failure to notify Johnston's secretary of needed mechanical repairs or adjustments and failure to notify mechanics at the repair depot of repairs or adjustments necessary calls for the investment of $1 in the "kitty."

What about accidents? Some little things aren't covered completely by insurance. In some cases there's a sum deductible, under which damages of less than $25 must be footed by the guilty party; in other cases a percentage of cost of repairs must be borne by the man who causes them—and there's the matter of retention.

"Each man," says Johnston, "is stuck with any damages he causes to our plane or to the property or person of another in cases where there isn't full insurance coverage." That makes the lads be careful.

So far, the plan has been working perfectly. There hasn't been a beef. There have been just a few fines. What advantage does this form of ownership have beside the financial? Goodwin says:

"There's this business of standing in line to get rental equipment. Everybody's been flying lately and there aren't enough rental ships to go around. First you wait to get a ship and then you are told how long you can fly it. It's hard to get into the air. And it's practically impossible to get in any cross-country time."

Wen Niles says:

"I'm one of those fellows who likes to know the airplane he flies. There's comfort in being familiar with a certain airplane, knowing it from spinner to flipper-tips. When you get into a ship you know, you know just what it's going to do, you know the state of repair it's in and just what its limitations are. You aren't fooling with unknown qualities.

"I'd been out of flying for some time when this club idea came along. I was either going to stay out or buy my own ship. This answered my problem. Luckily, all the boys work and play at different times, which means that everybody gets to fly when and where he wants to."

Johnston says

"Summing it up, you're a private owner. You have all the advantages of possession with just one-fifth of the expense. The plane encourages all of us to fly. You see, our payments are fixed, our hangar rent is fixed and our inspection-oil fee is fixed. The more a man flies the less his time in the air costs him per hour."

After approximately four months of owner-operation everything has worked

THE TRANSPORT LICENSE METHOD OF PRACTICAL AVIATION INSTRUCTION

is proving its usefulness in 200 colleges and 108 public school systems in the United States.

AVIATION APPRENTICES

Will you please give your attention to the following letter addressed to us by Mr. G. B. Drummond, Co-ordinator on the CPT Program at the New Mexico School of Mines, Socorro, New Mexico. It is repetition in substance, of a letter received by us from a widely known Air Commerce Inspector about four years ago.

January 22, 1941

"Dear Mr. Thompson:

A knowledge of mere theory without its application is useless. That is why I consider your texts to be the best that I have examined for use in my ground school for the training of civil pilots. Your presentation of the theory is sound and strictly in accord with the best practice. But in addition you have taken the trouble to give to the student practical examples of the application of the theory. The natural result of this is that the pilot who has studied your texts will have that confidence born of sure understanding of the underlying principles of flight and the associated subjects which make the competent flyer.

(Signed) G. B. Drummond"

"TRANSPORT LICENSE METHOD" means: A superior method of presentation; a superior method of self-examination; a logical sequence of thought in each volume; a sympathetic consideration of the student's viewpoint; elimination of excess wordage; plain English and extensive experience in teaching Aviation Ground School subjects; and last, but not least, presence on the market for 10 years, which eliminates any possibility of speculation. These texts have produced certificated Ground School Instructors of Aviation among people who succeeded exclusively by home-study, and our students are frequently accepted as airline co-pilots.

USE THIS CONVENIENT ORDER BLANK TODAY

THOMPSON AVIATION PUBLISHERS
8320 Woodward Ave., Detroit, Mich.

I am enclosing $.....{check or money order} for the texts checked below at left. Date.....

- ☐ **No. 1—A Practical Study of the Airplane** ..... $ 2.50
- ☐ **No. 2—Practical Aerodynamics for the Airplane Pilot or Mechanic** 2.50
- ☐ **No. 3—A Practical Aircraft Engine Study** 3.00
- ☐ **No. 4—Practical Meteorology for Airplane Pilots** 2.50
- ☐ **No. 5—Practical Air Navigation** 2.50
- ☐ **No. 6—Manual of Civil Air Regulations (A Study Quiz)** 1.50
- ☐ **Complete set of 6 texts—A Very Thorough Ground Course** $14.00

(We ship promptly, either by express or parcel post)

PLEASE PRINT PLAINLY

NAME .....

ADDRESS .....

CITY ..... **STATE** .....

out fine—but supposing there was internal dissension? Wouldn't five guys have a plane by the tail and be unable to let go? Not at all.

"Any man can withdraw and have his money refunded on a pro rata basis, set in accordance with the current value of the plane," Johnston says. "If the four remaining members are feeling rich they can buy out the man who, for one reason or another, wants to withdraw. Or, if they want to remain five, they can consider candidates for ownership and pick the one preferred and let him purchase the interest of the retiring member." At present, they have a waiting list.

Should there arise any question of disbanding entirely a meeting will be called, the matter will be put to a vote and, if four members want to sell, the fifth must agree for the common good. The plane then will be put on the market.

"So," says Niles, "there's no way that anyone can get stuck."

One thing the men have discovered is that there is a lot of multiple time. Often, two and even three will band together to take a trip to San Diego or to San Francisco, bid the ship in and thus kill a whole handful of birds with one stone. When several fly together they split oil, gasoline and other expenses, beside having a whale of a lot of fun. One flies, the others navigate and so on, giving multiple experience.

Recently, Goodwin and Johnston took a trip of this kind to San Francisco, approximately 350 miles away. Time going up was three hours and 25 minutes; back three hours and 45 minutes.

"Our gasoline expense amounted to less than $8," Goodwin points out. "We learned a lot, had a lot of fun. The same trip by airline would have cost us $70. We got by for a little more than one-tenth that amount."

Five or six hours a week is nothing to each man. Last week Goodwin flew from Los Angeles to Palm Springs and return and from Los Angeles to San Diego and return. Sandwiching in time were the other members, too.

"There isn't even any need for building up a reserve to buy a new ship," Johnston points out. "Our payments are gradually increasing our investment in the Stinson and, by the time we vote on a new model, we'll have it paid for. We'll trade, start all over again, and we'll probably have a bigger down payment, without any cash outlay at all, than we had on this one."

Johnston said he picked the partners carefully—men who have proved through years of association that they are regular, that they can work together. And all have mutual interests and problems.

"The secret is in knowing your men," he adds, "because if you don't, the plan will bog down."

Yes, everybody's satisfied—except that there's so much cross-country everybody wants either a one- or two-way radio. They're going to have to have a meeting about that.

END

Controllable Propellers

(*Continued from page 57*)

The change in pitch is obtained by the air pressure exerted on the additional blade section close to the tip.

The lower sketch gives a design of an adjustable propeller used on early French airplanes. A steel hub carried two adjustable blades made of steel tubing and aluminum. Section 3 shows a propeller of the Wright Brothers that was fairly flexible to give automatic adjustment. An automatic propeller of low efficiency was built by W. Kress in 1897, by using a bent steel tube covered with canvas. Another canvas job was built by Parsefal for airships, that consisted of a canvas strip fastened to a steel frame and pulled outward by the centrifugal force of a lead piece attached to the tip. With advancing speed the force acting on the blade changed the pitch.

The speed ratio of airplanes using low-power engines is not so high that a variable pitch propeller would give better performances. With the development of high-powered engines, the speed ratios increased and a variable pitch propeller became a necessity.

The upper sketch in Section 4 shows how the pitch can be controlled by a single lever. The lower sketch, however, shows an actual arrangement of gears to obtain satisfactory working units. This mechanical control is used in some of the propellers now in service.

Two designs of automatic pitch adjustment are illustrated in Section 5. The first uses an additional weight attached to the hinged blades to counteract the air pressure and bring the blade into a larger pitch. In the second design the rotating blades are interconnected by a lever and returnable to a lower pitch by springs. Centrifugal and air forces determine the pitch of the propeller blades.

In Section 6 a sketch shows a design that uses the centrifugal force to change the pitch and the diameter of the propeller. The blades are interconnected and the pitch is changed by the cam on the blade shank. The centrifugal force moves the blade outward and the cam increases the pitch. The springs retract the blades to a smaller diameter and a lower pitch in case the revolutions are lowered.

A design of a controllable propeller using a hydraulic pressure is sketched in Section 7. A hydraulic pressure controlled by a governor moves the piston, which will turn the blades toward higher pitch. To keep the blades at a fixed pitch a weight actuated by centrifugal force tries to turn the blades toward lower pitch. By attaining the same pressure a constant speed is also obtained. The hydraulic piston may be placed on the hub between the blades.

The design shown in Section 8 utilizes the air stream that rotates the spinner, having vanes at an angle opposite to that of the propeller blades. The centrifugal force of a weight placed within the spinner actuates a friction coupling for adjustment of the desired angle. The adjustment may be made from the pilot's seat or the unit may drive a small dynamo actuating a solenoid that changes the blade angle. The adjustment is obtained by the variation of the resistance in the solenoid. Some designs use propellers instead of vanes, which are called air brakes.

A very neat design is the electrically-operated variable pitch propeller. An electric current turns a small motor at high revolutions. This motor is connected to a speed reducer of unique design. A sketch in Section 9 shows its working. The reducer has a center cam that moves numerous plungers into a spur gear. If the number of the plungers is one higher than the number of teeth in the gear, then for one revolution of the cam the gear moves ahead only one tooth. Coupling two reducers, each having 40 teeth, the reduction will be 40×40 or 1,600. Feathering is easily obtained with this design.

A design that employs the change of blade area is sketched in Section 10. Two cross-sections show the fixed portion and the movable portion. A plurality of spindles actuated by bevel gears move the rear portion outward, increasing the area of the blades. The casing is made flexible to keep the surface of the propeller always smooth.

A design that incorporates the enlargement of the diameter and the same time the change of blade angle is sketched in Section 11. The centrifugal force moves the tip outward, the cam rotates the unit and compresses the spring. By lowering the revolutions of the propeller the spring will return the tip to its original position.

A combination of an automatic and controllable propeller is illustrated in Section 12. It comprises a fixed blade section and a flexible airfoil surface held in place at the trailing edge by a resilient rod. The change in pitch is obtained by the air pressure or manually by twisting the rod.

Increasing the diameter and the blade

Megow's
Ranger
MODEL
BUILDING NEEDS
Famous Model Kits
MEGOW 199 MOTOR
Sponge Rubber Wheels
Propellers
COLOR CODED BALSA
Battery Holders
Special Knives
KWIK-DRY CEMENT
etc., etc.
MEGOW
$1.50
Winner of 16 championships. A new steep-climbing gas model selling at a sensationally low price. 46 inch wingspan. Weight, ready to fly, 18½ ounces. Send 10c for big 132-page illustrated catalog — airplanes, ships, railroads, etc.
Dept. PA., Howard & Oxford Sts., Phila., Pa. or 217 N. Desplaines St., Chicago, Ill.

COLT 45 Cal.
"FRONTIER"
MODEL
$1.45
Basswood construction kit with working plans, machined barrel, cylinder and all necessary hardware.
COLT 45 Cal. "FRONTIER" model kit. 4¾" barrel. $1.45
COLT 45 Cal. "FRONTIER" model kit. 5½" barrel. 1.55
COLT 45 Cal. "FRONTIER" model kit. 7" barrel. 1.70
COLT 45 Cal. Automatic Pistol kit. 1.00
Full scale Thompson Sub Machine Gun model kit. 3.00
SAVAGE Cal. 32 Auto. Pistol kit, machined barrel. .75
LUGER Auto. Pistol with 4" machined barrel. 1.75
LUGER Auto. Pistol with 6" machined barrel. 1.90
COLT 25 Cal. Automatic Pistol kit. .50
These beautiful kits are complete in every detail and made of the best basswood. All parts are cut to shape and require only a short time to finish. Postpaid in U. S. A.
GUN MODEL CO.
Dept. KA-5, 2908 N. Nordica Ave. Chicago, Ill.

angle is incorporated in the design shown in Section 13. The shank of the blade is fluted spirally, which increases the blade angle if moved diametrically outward. Spindles, operated automatically or manually, give the desired diameter and pitch.

Extremely high elastic deformations of the hub are developed by the centrifugal, gyroscopic and air forces, which may separate the bearing surfaces from each other. The blade may then be supported by only one bearing. This condition may be dangerous, because it may be the source of vibrations and uncalculable stresses. Therefore some propellers are assembled under pressure that will not permit the bearing surfaces to part under service. The initial load under which the unit is assembled should be equal to the highest force developed during flight. Three methods are pictured in Section 14. One uses the compressive force of a spring. The other uses a corrugated hub and another a resilient ring. Propellers are generally held together by an annular nut which cannot be tightened owing to the friction on its surface. Therefore pressure must be exerted to obtain the necessary stresses.

Scientific studies of stresses on hub casing were conducted by making a wire model of the openings and covering it with soap bubbles. The film then gave the outline of a surface of equivalent stresses (Section 15).

It is usually simple to check a variable pitch propeller for static (knife-edge) balance. Lately, however, dynamic balancing is the final assurance.

There are many other designs of variable pitch propellers. Hundreds of patents are issued; most of them vary only in details.

END

Want a Job?

(*Continued from page 52*)

teletype service that operates inter-city) service in addition to radio.

Most of United's starting radio operators are drawn—as junior operators—from one of the three following sources: (1) the Navy; (2) radio school graduates; (3) amateurs. Mr. Wrightson said that he had found many of his best radio operators among the amateurs. He said that he thought this was because almost all amateurs made radio their hobby and were so completely absorbed with all of the many phases of the subject that they made it a point to learn everything about radio they could cram into their heads. He also paid them a fine compliment by saying that, in his opinion, many of the advancements which we now enjoy in the field of radio have resulted from the entirely unprofessional and enthusiastic research of amateurs.

To start as a junior operator requires a second-class radio operator's license. A junior operator will work a normal shift, during which time he will be responsible for the transmission of the signals called for by the dispatching staff.

* * *

A senior radio operator—to which a junior operator is promoted when he is qualified and there is a vacancy—must have a second-class telephone operator's card, plus a whale of a lot of experience. He works a regular shift, like the junior; but is considered to be more competent. Over him is a chief operator, who is responsible for all the communications of a station. The chief operator does not work a regular shift, but does work all relief jobs and answers for all the executive communication work of his station.

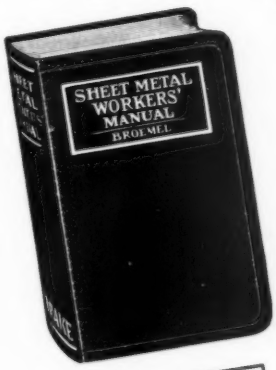
In the other categories of communications, we have switchboard telephone operators (women) and teletype operators. The former are usually trained by the telephone companies; the latter by the telegraph companies. For teletype, the emphasis is on excellence and accuracy in typing. Male and female operators are chosen for teletype work on the basis of good character, intelligence and mechanical perfection.

* * *

Maintenance. We thought we would be able to get through the material at hand in this month's column. We can't. We'll give you what information space permits, then let the rest of it lop over into next month's piece. But we see, on looking back over this, that most of the jobs we've mentioned called for skilled personnel. Here are some that are more within the reach of everyone. Let's look at the maintenance division, whose job it is to keep an airline's ships in the air. At each station are a licensed mechanic, or mechanics, whose job it is to service ships for the trip upon which it is about to be dispatched. We don't mean that

AVIATION INDUSTRY NEEDS SHEET METAL WORKERS!

Only $1 Starts Your TRAINING



Let this big, authoritative 554-Page Text Book prepare you for a fascinating and well-paying job.

SHEET METAL WORKERS' MANUAL

by L. Broemel

Thousands of sheet metal workers wanted at once by the ever-growing aviation industry. And here's a quick, reliable way to get a head start preparing for a well-paying job in this field. Study "SHEET METAL WORKERS' MANUAL" . . . a complete, practical instruction book on the sheet metal trade. 554 pages of the most helpful information on this subject ever published. This authoritative text is used by the U.S. Army and Navy, Aviation Schools, as well as universities, colleges and high schools. What further recommendation need there be! Easy to read and understand. Priced at only $2.00, profusely illustrated. Start your training now. Use handy coupon below.

Write today for complete catalog of Drake's books on other technical subjects. It's Free!

Drake's Books Sold at All Good Book Stores

"WIN YOUR WINGS"
by Col. Roscoe Turner and Jean DuBuque

2 fascinating volumes contain required material for preparation for pilot's and instructor's written examinations. Follows new requirements of C.A.T.P. Book I includes: Elementary Flight Instructions; Aerology; Navigation; etc. Book II includes: Advanced Flight Maneuvers; Instrument Flying; Engines; etc. Endorsed by some of the greatest names in aviation. 2 vols., cloth bound, over 1000 pages, 600 illustrations. Per vol.... **$3.50**

"AVIATION from the GROUND UP"
by Lieut. G. A. Manly, U.S. Army Air Service, Ret.

An aviation library condensed into 389 fact-packed pages . . . authoritative . . . concise . . . easy to understand! USED AS A TEXT BOOK IN FLYING SCHOOLS! Includes Theory of Flight; Details of Airplane Construction; Engines; Rigging; Instruments; Navigation; Parachute, etc. Written by a man who knows every angle of flying. Cloth bound. 187 illus. **$3.00**

USE THIS COUPON!

Fred'k J. Drake & Co., 626 W. Van Buren St., Chicago

Send me the following books at once (check ones wanted)

"SHEET METAL WORKERS' MANUAL"—$2.00 .....
"WIN YOUR WINGS"—Vol. 1—$3.50
"WIN YOUR WINGS"—Vol. 2—$3.50
"AVIATION FROM THE GROUND UP"—$3.00

I will pay $1.00 per volume at once (C.O.D. plus postage .....Remittance herewith .....) and will remit the balance at the rate of $1.00 per week until fully paid. If I am not fully satisfied, I will return books within 5 days and my money will be refunded. (Postage prepaid if you send cash in advance.)

Name.....
Home Address.....
City.....State.....
Employed by.....
Reference.....
Address.....
(Parent's signature if under 21—Outside Con U.S. cash with order.)

FRED'K J. DRAKE & CO.
624 W. Van Buren St. Chicago, Ill.

every station will have a repair depot. Repair depots (they are really miniature airplane factories, equipped to perform every type of repair to the structure, instruments, engines, and hydraulics of a transport craft) are spaced at strategic intervals throughout the airline's system, usually at division points. They do all major overhauls.

But at every terminal there will be a sufficient store of all types of parts, engine components, radio equipment and instruments to replace those which may have gone bad during a trip, as well as facilities for routine servicing operations.

Apprentice mechanics—that's where beginners start—are chosen from among the graduates of the "master mechanic's" courses given by approved schools, from the ranks of ex-service men or from persons who have had long experience as mechanics in other fields of commercial aviation. Aircraft and engine mechanic's licenses are desirable, of course, although they are not essential. Qualified men are given a year's credit on their four years' apprenticeship. Apprentices who are qualified for a mechanic's rating are promoted when a vacancy occurs. Apprentices do a helper's work under the mechanic's supervision, fueling ships, doing minor repairs and cleanup work.

Mechanics (this is the next highest grade) must have A & E licenses, plus a second-class radio license. They do line work, radio installations, engine overhaul or anything that may be required in the way of service. Wages are good. Radio maintenance men also are employed. They must be specialists and know radio thoroughly. They must also have second-class operator's licenses, due to the exigencies of Federal requirements for the repair and servicing of radio equipment. Many are drawn from other lines of radio work.

Lead mechanics superintend the mechanics. They have considerable executive and supervisory work to do in addition to their specialized mechanical work. Over them are crew chiefs (in charge of a shift) who do all of the inspection work. Each crew chief leads a shift.

* * *

The chief of maintenance for a field is the station chief of maintenance, who has to answer for all maintenance work done in his particular station. He's a big shot and usually has a desk and secretary. You work up to this job through the others, by way of ability and experience.

* * *

Next month we'll go on with this. In the meantime, we can't answer any letters in the column. We will, though, take every letter into consideration. If there are enough letters on any subject, we'll kick the lid off it for you. So don't slack off. But we'd rather you didn't send those self-addressed stamped envelopes. It isn't once in a blue moon that we answer letters directly. We can't. There are too many of them—and besides, we like to have other men get in on your problems. What we are trying to do is to cover the fields in the aircraft industry that your letters indicate need covering. . . . Incidentally, we haven't been able to find a place for watchmakers in the industry, yet. But we'll keep trying. . . .

Next month, we'll go on with airline employee requirements. We've lots of dope on it. . . . Purely off the record, we didn't like that crack about us M.K. made in his March "Airy Chat" column. If he isn't careful, we'll send him a picture of us. But we'd rather not. We pride ourselves on being considerate. It ain't every contributor that's decent enough to hide his face under a diving helmet. We feel hurt that M.K. didn't appreciate our consideration.

END

Small-Town Papers

(*Continued from page* 36)

filled four Sunday rotogravure pages crammed full and attracted much favorable comment from readers. Army engineers and the National Resources Council requested and got complete sets of the prints to aid them in their studies of the worth of the project. Many industrial concerns eagerly bought prints—at $5 each.

The cost? Oh, $16.50 worth of flying time and a pleasant afternoon's work.

That same *Cub* has been invaluable in getting the material for articles for FLYING AND POPULAR AVIATION—in Cleveland, Pittsburgh, Columbus and other cities. Gathering material for articles requires time and travel and that *Cub* has enabled me to spend pleasantly and profitably many an afternoon that might otherwise have been wasted—an afternoon that would have been too short for a trip of similar distance by automobile.

Covering aviation news is a difficult job because of the constantly changing picture and because airports usually are far apart. In our territory are seven small, widely-scattered airports. It is a tedius, time-consuming journey to visit them by automobile. But all are only a few minutes apart by lightplane. So the *Cub* does the job.

Our district—the territory within a 25-mile radius of Youngstown—is probably the nation's "steeliest steel area." Great steel mills costing hundreds of millions of dollars line the river valleys, spewing great clouds of black smoke and exhaust steam. The Youngstown district probably produces more tons of steel per capita than any other steel district in America. No wonder, then, that many leading business publications, many business leaders and so many commercial agencies eagerly study the Youngstown district steel operations figures each week. For they represent business trends. No wonder steel reporting has become such a highly specialized trade.

You can understand, then, the consternation that was caused when a steel executive summoned reporters to his office one day some years ago and announced:

"Gentlemen, we—the executives of the leading steel companies here—have decided that hereafter we no longer will make public our operating figures. We no longer will permit any of our personnel to give out any type of news stories about our companies."

Telephone calls to other steel executives quickly confirmed the first one's announcement; the executives were obdurate, protests were of no avail. There would be no more announcements of operating figures—and no more confidences.

"Then," one reporter informed them, grimly, "We'll have to get them in our own way."

Stop at
EUCLID AVENUE
East side Cleveland's nearest airport
Near-by Tourist home—Bus service to Cleveland.
DETHLOFF FLYING SERVICE

Prepare Now For **YOUR LICENSE**
Airplane mechanic's home-study course $1.25. Engine mechanic's course $1.25. Both courses $2.00. Postpaid or C.O.D. Contains all license questions with answers and accurate diagrams. Helps you tremendously in your mechanic's as well as Pilot's License Exams.
"250,000 Aircraft Mechanics needed for U.S. Defense."
MEYER ENGINEERING, Box-S-F Hempstead, N. Y.

AUTOMOBILE RACING BOOK—Fifth Edition
12 Chapters, 77 Illustrations dirt track, championship and midget cars. How to build engines, chassis and bodies. Why the fast ones are fast and how to make them fast. How to speed up Ford V-8 cars and rebuild Ford A and B Engines. How world's record cars are built. Official AAA midget rules and international formula. Order Now—$1.00 postpaid; $1.15 C. O. D. Money back if not satisfied.

RAY F. KUNS, Dept. E-29, Madisonville, Cincinnati, Ohio

Do You Know How to Install An Aircraft Radio?
Power Supply AVA-51 & 51A
Ship's Battery
AVR-15 & 15A Receiver

Ground to Ship's Frame
Symmetrical Belly Antenna
A. Transformer (Directly over center of Antenna)
What is the "automatic pilot-radio compass?" Do you know that there is a new loop antenna on the market that is remotely operated by means of a flexible cable and tuning mechanism, and enables the pilot or radio operator to take bearings for "position fix" while in flight? Are you posted on the improvements to existing equipment which aids blind flying and over-cloud navigation? Read all about the fast-moving aircraft radio industry . . . new sets and equipment, servicing kinks, engineering problems, marketing data, and research . . . in the Aviation Radio column of RADIO NEWS, America's most popular radio magazine. Get your copy of the April issue today!
April Issue **RADIO NEWS**
NOW ON SALE AT ALL NEWSSTANDS!

The business public demanded those operating figures—and demanded that they be accurate. It also demanded other news of the steel industry; necessity being the mother of invention, the reporters quickly devised a way to get them.

By flying over the huge steel plants occasionally—for admittance at the mill gates was strictly forbidden and enforced by the mill police—the reporters learned how to observe the various signs of industrial activity, the number of parked automobiles, loaded freight cars in the yards and locomotives at work. Besides, they learned the location and capacity of every blast furnace, open hearth furnace and Bessemer converter and the meaning of the various colors of smoke issuing from the stacks. Putting two and two together, they were able to report steel operations as accurately as ever before—although at the cost of a lot of additional effort. Soon the "no publicity" policy, failing to work, was abandoned.

There have been many other jobs, too. For example, Youngstown now is building a $2,500,000 airport and it required a lot of traveling to airports in other nearby cities to get information to help in paving the way for it. The *Cub* helped out a lot. It also produced some excellent photographs of progress of the work; it made the first landing on the airport site the day work was started and, when the airport's first runway was completed, it carried to the field the first passenger to be landed there—an 82-year-old city councilman.

During the "Little Steel Strike" of 1937 airplanes were used by reporters covering the strike to observe what was going on within the strike-bound plants. A few had narrow escapes when hidden snipers, mistaking the planes for those being used to haul food and other supplies into the beleaguered plants, fired at them with high-powered rifles.

There are a thousand and one other potential uses for a lightplane—circulation stunts of various kinds with airplane rides or trips as prizes. Air views of smaller towns in the circulation district are excellent circulation builders; folks eagerly look for their own homes in the air views of their communities. The modern lightplane is particularly useful for aerial photographic work because of its slow stalling speed, insuring a better chance of getting good shots under adverse conditions. And it is particularly safe because it can get into and out of the tightest, roughest fields which larger ships wouldn't dare use.

Now, suppose you're an executive editor of a smaller newspaper, eager to use an airplane in your business. You would want to know just how much it is going to cost you. Well, you can rent a lightplane for from $5 to $9 an hour—and you can cover a lot of ground and take a lot of pictures in an hour. Or you can buy your own ship. That probably would would be your best bet, because it always is available and it gives you enough advertising to justify the extra cost—at $1,300 to $3,500, depending on the ship.

Your total annual cost will run from $300 to $800 a year, depending on the make of ship you buy, how much you use it, how much insurance you carry. For example, depreciation will cost $300 to $500 the first year and graduating lesser amounts each succeeding year. Insurance will cost from $75 to $200 a year, hangar rent $7 to $15 a month, gasoline, oil and maintenance $1 to $1.50 per flying hour.

You will find it well worth it.

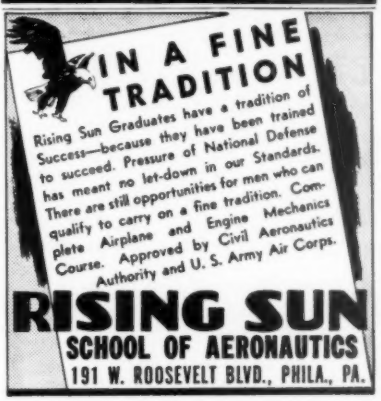
END

Materials: same as those specified and supplied to U. S. Army Air Corps Flyers. Made of pliable brown Horsehide Leather. Leather collar and shoulder epaulets. Double knitted hip-band and cuffs. Concealed heavy-duty zipper and flap pocket fasteners. Durable lining. Sizes 36 to 46 chest measure. Specify height and weight when ordering.

Include money order or check with order plus 45c for handling.

Write for Our Latest Flying Suit Leaflet No. 11

AERO LEATHER CLOTHING CO.
79 FERRY ST., BEACON, N. Y.
CONTRACTORS TO THE U. S. ARMY AIR CORPS AND U. S. NAVY


IN A FINE TRADITION
Rising Sun Graduates have a tradition of Success—because they have been trained to succeed. Pressure of National Defense has meant no let-down in our Standards. There are still opportunities for men who can qualify to carry on a fine tradition. Complete Airplane and Engine Mechanics Course. Approved by Civil Aeronautics Authority and U. S. Army Air Corps.
RISING SUN
SCHOOL OF AERONAUTICS
191 W. ROOSEVELT BLVD., PHILA., PA.

PRACTICAL TRAINING
To meet the Increased Demands of
AVIATION
U.S. GOV'T Approved
LUSCOMBE
SCHOOL OF AERONAUTICS
(Div. of LUSCOMBE AIRPLANE CORP.)
DEPT. "A" MERCER AIRPORT WEST TRENTON N. J.
Superior Luscombe training qualifies you for a permanent well-paid position in America's fastest growing industry. Your practical Luscombe training under experienced instructors using modern equipment puts you in demand wherever airplanes are built, serviced or repaired.
ENROLL NOW, get started on a profitable future in Aviation. Train at Luscombe School of Aeronautics, Division of Luscombe Airplane Corporation, the largest manufacturer of all-metal light-planes. Free Placement Service.
CLASSES NOW FORMING
Write for FREE descriptive folder, "Aviation Today and Tomorrow".
2 MONTHS WELDING COURSE
3 MONTHS SHEET METAL COURSE
8 MONTHS GOVERNMENT APPROVED AIRPLANE MECHANIC'S COURSE
8 MONTHS GOVERNMENT APPROVED ENGINE MECHANIC'S COURSE
1 YEAR GOVERNMENT APPROVED MASTER MECHANIC'S COURSE

BIG MONEY Assembling NEW MEAD KI-YAK at Home!

WRITE for big illustrated FREE Circulars!

MEAD'S complete cut-to-fit KI-YAK Kit easily assembled for pleasure or profit! Portable. Seaworthy. Light. Fast. Highest quality. Low cost. 3 models 20 lbs. to 45 open a new world of sport for you both in sailing, paddling. Also 2 portable Outboard Models. Double paddle or Oars now included with your Kit. Write for Free, lavishly illustrated circulars, low Factory-To-You prices!

MEAD GLIDERS, 15 S. Market St., Dept. E-51, CHICAGO

Learn AIRCRAFT CONSTRUCTION and MAINTENANCE

WESTWOOD School of Aeronautics Inc.

BASIC BACKGROUND COURSE for all phases of Aircraft work... by outstanding factory engineers. Keep present job while training. Start now! Short course. Low tuition. Terms.

Write for FREE Booklet
514 Village Station, Los Angeles, Calif.

WORLD WAR AVIATION BOOKS AND PHOTOGRAPHS

NEW and USED, Technical-Historical, Modern, ALL branches of Aviation. Send 3c Stamp for "S" list. Trades considered. We Buy Books.

AIRBOOKS
P. O. 958 NEW ROCHELLE, N. Y.

LEARN TO FLY

Government Approved School
Modern Service & Repairing
Taylorcraft Distributor

CLINCH FLYING SERVICE
NORTH PLATTE

"Blackout" Bombproof Aircraft Factory for California!

Uncle Sam's vigil light over the western ramparts we watch glows brighter! Blackout, a word that once came only in some imaginable dream, is brought closer to home! Yes, the construction of Douglas' new $11,000,000 blackout factory at Long Beach, California, becomes one of the most startling steps taken in America since the outbreak of Axis-Nazi warfare. Don't fail to read all about this huge camouflaged airplane plant in an exclusive, authoritative article in the fact-filled picture-packed

JUNE ISSUE

FLYING AND POPULAR AVIATION

AT ALL NEWSSTANDS MAY 10TH!

Ferry Hop

(*Continued from page 22*)

to spear bundles of piscatorial rainbows as they effortlessly out-maneuvered us among the brilliant coral. Although assured by the local talent, we were still squeamish about the possibility of meeting wayward shark and tiger eels on their home grounds. Eventide found us finally ashore after obtaining few fish and much sunburn. . . .

A few hours out from Wake the sky looked dark and threatening ahead. This was the weak front the weather report showed. With a change in cloud formation one usually expects a change in wind. A drift sight confirmed this. The increase in headwinds cut our ground speed down. I moved my dead reckoning position for the coming two hours back. With the dividers, I picked our hourly position off the chart and reported it in latitude and longitude. As the other planes sent their reports in to the squadron navigator, the marked similarity was an indication of the accuracy of modern aircraft navigation. A slight change in course was made next, to take into account the gradual change in magnetic forces as we progressed across the face of the earth.

I called up the tower. This is the term we use for the mechanic's station streamlined into the wing. I inquired concerning fuel data. Present consumption per engine per hour and remaining fuel aboard was promptly reported. We flew with a more than adequate fuel reserve, which was always reassuring. With a swing of my circular slide rule, I obtained the number of hours we could fly with the remaining fuel.

Cruising at 10,000 feet, I felt cool so went aft to the clothes rack and put on a flight jacket and woolen socks. The off-duty mech was enjoying a well earned nap, snoring away in one of the bunks. Back at the nav table I double-checked my calculations, realizing that speed and accuracy suffer after flying over 10,000 feet without a boost of oxygen for any length of time.

The third pilot beckoned me. The Flyer's Cross was accompanying us. Projected on the stratus clouds below us was the plane's shadow, somber and black. Surrounding it was a circular rainbow. This halo of the spectrum framed the cross, setting it forth in dazzling contrast. I thought this must have been a symbol of extraterrestrial good luck.

One hundred miles out from Guam we started letting down, losing altitude and increasing speed. Soon Guam appeared, silhouetted against the horizon. It gradually changed into something with depth and color as we approached. From our data folder I got the chart of the harbor to check the landing area, especially noting the location of submerged coral heads that would tear our plane's bottom out. A few small rain squalls came into the area. We dodged these while circling in formation. After landing, we taxied cautiously up to a buoy and refueled. By this time the sun was sinking in the tropical sky.

The next dawn we rode out to the plane from the aircraft tender where we spent the night. Those who had remained in the plane were ready for take-off. Soon we were in the air and I had my chart laid out for the day. Some 300 miles were behind us and the navigation was running along smoothly, with a couple of good sun lines that checked closely with my dead reckoning positions. I climbed into the seat for my turn at flying. We were in loose formation which allowed the pilots greater relaxation. Gradually the plane ahead grew smaller. I eased the throttles slightly ahead and the gap slowly closed. The formation was like a slowly pulsating accordion, flexing back and forth in the sky. Looking forward was a beautiful sight. We were near the rear of the formation and could see the other 13 planes shining like silver jewels against the azure sky. Far below, on the seemingly endless expanse of the rolling ocean, was a ship. I wondered if she had seen us streaking across the sky. Our nose went up lazily: someone must have been walking aft in the plane. A slight adjustment of the elevator tab and we were balanced again on even keel. I checked the compass and settled on course again.

Far ahead were the towers of cumulo-nimbus thunderheads, reaching into the heavens. Would we go over them, under them, around them, or through them? The last thought didn't comfort me any too much. That decision would call for a deployment of the squadron, with each plane groping through on instruments while flying with 13 other planes in the same overcast. I breathed easier; the squadron commander was starting to detour around them. To keep an accurate account of these changes, I hopped down from the seat after first turning the controls over to the third pilot. Back at my chart, I plotted in these small, frequent but significant shifts of course as we picked our way about the obstacles.

Soon we made our landfall: one of the eastern islands of the Philippines. From now on the hop was just piloting, as every little island from 10,000 feet looked like its outline on the chart. There are over 7,000 of these islands in the commonwealth. As we went over the coast of Luzon, many arrow-shaped outlines were sighted on the water. They almost appeared to be air markers that signaled for us to follow them. Later we found out that they were native fish traps.

With a feeling of pride and achievement the squadron, upon approaching Manila, closed up into a tight formation. A turn over the city and we peeled out of the formation to take distance for landings. The water, the ramp and the signal to cut engines.

Another "routine Navy flight" was finished. END

Lightplane Record

FLYING a 65 h.p. Taylorcraft, Miss Grace Huntington of Pasadena, Cal., recently set a new world altitude record for lightplanes by climbing to the officially-recognized level of 24,311 feet. Miss Huntington wore a flyer's oxygen mask designed and perfected by Mayo Clinic experts.

Flying Cameras

(*Continued from page 24*)

onds—depending upon the speed of the plane and the amount of overlap. The photographers keep operating until the navigator notifies them that the course has been covered. The plane wheels around and returns on a parallel course, with a certain amount of overlap on the side.

The flying camera can cover 80 miles on a single flight with one load of film. A single loading of film in one plane can cover up to 3,000 square miles—which means that a 15-plane squadron could photograph nearly 50,000 square miles in a single flight.

The plane can also mount the Army's K3 single lens mapping camera, which can use a 24-inch focal length lens for work at altitudes up to 25,000 feet. Often mounted beside this is another giant, the K7C. This is a spotting camera, used in reconnaissance to picture the characteristics of some speecial piece of terrain, to record troop movements or expose camouflage. It also has a 24-inch lens. Both of these cameras are equipped with electrical devices for winding film. The plane also can carry a number of hand-held cameras, both movie and still, which are projected through the removable panels in the door or roof of the ship. These cameras are used for spotting ground activities or action in the air.

In Europe, the photographic ships which come over in the daytime after a night of raiding enjoy comparative immunity. Weary anti-aircraft gunners don't waste much ammunition on the high, solitary flyers, as long as they keep their distance. But under different war conditions, the defending forces might be very much interested in keeping photographic planes away. The ever-increasing accuracy of ground fire makes it necessary to give these ships some sort of protection.

The flying cameras are able to seek protection in two ways—altitude and night. The development of "Big Bertha" cameras has made it possible for pictures to be taken from five miles up. But haze conditions often interfere. To combat this, the Army employs an infra-red film which pierces the haze. For night photography, they use heavy flash-powder bombs. These are controlled by time fuses, set so the powder will explode at a certain interval after leaving the plane. The flash trips an electrical device on the plane, opening the camera shutter.

In the kind of war they're fighting in Europe, photographic ships have largely replaced the observers of the last war. There is not a military objective on the continent which has not been photographed time and again—before, after and during raids. It was pictures of the docks in the channel ports, taken day after day, which revealed to the British the exact status of Hitler's plans for invasion. They counted the multiplying barges from day to day and, when it looked as if he had enough to make it worthwhile, they bombed them.

This tantalizing practice is common where aerial photography is used. Photographs of an area may reveal faint tracks converging on a wooded spot. Each day, these tracks grow more distinct. It becomes plain that the enemy is installing a battery in the woods. Now some hasty armchair strategists might suggest that the spot be bombed immediately. But military men find it much more satisfying to give the boys time to do a lot of work on the job and get it just about finished before they blast it down.

So, every time you read of a furious British onslaught on the French channel ports, you can be sure their photo planes have revealed the Germans concentrating enough materiel there to make it inviting

The photo ships which hover over bombed cities the morning after are bringing back a wealth of information that no observer could hope to record. Their pictures will show exactly what factories have been struck, what oil tanks remain whole and how long it will take to repair the railroad terminus. These pictures have real military as well as propaganda value. In the battlefield operations, such as those in the Mediterranean theater, the camera has shown itself to be easily the most efficient method of observation. No body of troops nor any quantity of materiel can be moved without leaving a trail. Bent blades of grass, ruts left by wheels or freshly spaded earth will show up plainly in pictures. They betray the strength and direction of troops.

Camouflage must be mighty good if it is to be concealed from the camera. Only natural camouflage—cut limbs, leaves, etc.,—will look natural in a photograph and this will have a false appearance as soon as it begins to get dry. Batteries, firing from a wooded spot, will scorch leaves near the muzzle of a gun and betray their presence to the camera. The increasing use of color cameras makes the detection of camouflage increasingly simple.

It is easy to see how dependent we would be upon this important instrument of observation and mapping should this country be involved in a war of movement in defense of the hemisphere. Particularly would this be true in any fight to the south, where troops would be moving through rough terrain which is poorly mapped. It becomes obvious, then, that there is a serious need for these squadrons of flying cameras. They are one unique answer to our own unique needs for hemisphere defense.

END

WPA Trains Groundlings

AVIATION ground servicemen are being trained by the WPA "to meet the increased needs growing out of the rapid expansion of civil and military aviation." According to WPA officials, a maximum of 5,750 persons from WPA rolls will be given two to three months' training at airports designated by the C.A.A. These servicemen, while not required to be expert mechanics, must be familiar with aircraft, their fueling and checking, C.A.A. traffic regulations, clerical and paper work incidental to airport operation and the requirements of airport maintenance. WPA money totaling $1,429,690 has been appropriated to train persons in this work.

Order Coupon

KARL ORT 695 W. Poplar St., York, Pa.

Enclosed find $ _____ Send quantities indicated below

No. 302.....$1.95		No. 2928.....$1.00	
No. 3455.....50c		No. 3456.....50c	
No. 1510.....$2.95		No. 206.....$7.85	
FREE CATALOGUE		No. 2326CB..$3.50	

NAME _____

ADDRESS _____

CITY _____ STATE _____

You Don't Say!

(*Continued from page 54*)

Waldorf-Astoria Hotel, New York City; and the Morrison Hotel, Chicago.—Ed.

Mistake

Sirs:

. . . In your March issue, in "Have You Seen?", you state that the device shown on the German Ju-87 for throwing bombs clear of the propeller in dive bombing was first used by that plane. You imply that the similar device shown on a U.S. Marine Corps SBD-1 is a copy of the German device. I am a member of the Naval Reserve and, while on active duty in July, 1939, saw such devices used by Marine Corps Great Lakes BG-1 dive bombers and Navy Vought SBU-1's. At that time the device was not experimental, but was in actual use by service squadrons. . . .

ROBERT SAUER.

Rosedale, N. Y.

● We stand corrected.—Ed.

Bungled Starter

Sirs:

. . . In "Shotgun Starter" on page 56 of your February issue it is stated that the cartridge is fired by manipulation of the knobbed arm at the inside end of the case. This is absolutely untrue. Being an instructor here in the airplane mechanics course, I should know. . . .

The knobbed arm is for the sole purpose of locking the breach, which you called the case, to the right of the pilot's hand. This knobbed arm has nothing whatsoever to do with the firing of the cartridge—which is fired by electricity controlled by a switch inside the cockpit. And the electricity does not jump a gap to produce spark to ignite the charge, either. It melts a fuse inside the cartridge case, which produces enough heat to set afire a celluloid cap, also inside the case, which ignites the charge. . . .

KENNETH H. PITZER,
14th School Squadron.

Chanute Field,
Rantoul, Ill.

Worth It

Sirs:

. . . The article in your February issue, "The Stall and the Turn," is worth the price of a year's subscription. While not supplementing personal instruction, such articles tend to keep alive and refresh the things we should constantly remember. Won't you secure for each month an article that will carry such information for the benefit of the ever-increasing number of newcomers to aviation? It will do the advanced flyer some good, too. . . . Just to whet the appetite, if nothing else. . . .

NESTOR R. SCOHY.

Sisterville, W. Va.

● Turn to page 39.—Ed.

Correction

Sirs:

. . . It appears . . . from the article in your February issue that there was a misinterpretation of the data furnished you. . . .

[Our] 80 h.p. airplane has a top speed of 125 m.p.h., in place of 115 and the selling price should be approximately $2,300 instead of $2,500. The selling price of the Lycoming 65 h.p. job will be approximately $1,800 equipped. . . .

We are pleased to inform you that I have purchased the Jensen interest in the Stearman-Jensen corporation and the new corporation is taking the name Glenn A. Stearman Aircraft, Inc., and will continue operation at the Coffeyville Airways airport. . . .

GLENN A. STEARMAN.

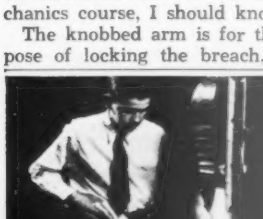
Coffeyville, Kan.

Idea

Sirs:

. . . The following might conceivably be a slight contribution to the defense program. My patent attorney tells me that games similar to "Authors" and the good old Methodist game of "Flinch" could not be patented. A few years ago one was on the market called "Trees," which taught the different species of trees effectively. In the current American Legion magazine I note that, in recent maneuvers for air defense, civilian observer groups were given plane silhouettes to study. A friend on civilian observation in England writes of the terrific monotony of such work and asks for "games and other nonsense" to while away the time.

It occurred to me that a game similar to "Trees" and modeled after "Authors," but using the different foreign planes as



PLAN ALL YOUR PICTURES WITH THESE

20 Authoritative Text Books at Your Fingertips!

Little Technical Library
Reg. U. S. Pat. Off.
PHOTOGRAPHIC SERIES
AT ALL LEADING BOOK AND CAMERA STORES

No. 1—YOUR CAMERA AND HOW IT WORKS by W. E. Dobbs and Charles A. Savage. Selection, use, focusing, composing, lenses, shutters, filters, problems, etc.

No. 2—DEVELOPING, PRINTING AND ENLARGING by Al and DeVera Bernsohn. Elementary and advanced developing, chemicals, types of printing, elementary and advanced enlarging, enlarging equipment, etc.

No. 3—FILTERS AND THEIR USES by W. Bradford Shank. Light, film sensitivity, types of filters, polarizing screens, color separation, lens shade, problems, etc.

No. 4—COMPOSITION FOR THE AMATEUR by Kenneth Heilbron. Joining subject and picture, the picture as a whole, tone, lines, rhythm, etc.

No. 5—MOVIE MAKING FOR THE BEGINNER by Herbert C. McKay, F.R.P.S. Modern movies and cameras, using the camera, production, titling, projection, etc.

No. 6—COLOR IN PHOTOGRAPHY by Ivan Dmitri. Types of subjects, separation negatives, density scales, wash-off relief printing, chromatone printing, etc.

No. 7—CHILD PHOTOGRAPHY by Harold Lambert. Cameras and equipment, taking the shot, posing, finishing and processing, etc.

No. 8—HOME PORTRAITURE AND MAKE-UP by Maurice Seymour and Syd Symons. Part I: Tools, lighting, posing, background, etc. Part II: Restyling contour, eyes, eyebrows, lips, etc.

No. 9—TRICKS FOR CAMERA OWNERS. An outstanding collection of the latest and most valuable kinks and hints on every phase of amateur photography.

No. 10—A GLOSSARY FOR PHOTOGRAPHY. Compiled by Frank Fenner, Jr. Over 3,000 words having photographic significance are defined. They cover still and motion-picture photography in black-and-white and color.

No. 11—OUTDOOR PHOTOGRAPHY by Samuel Grierson. A comprehensive coverage of the picture possibilities found outdoors; landscape, pictorial, etc.

No. 12—INDOOR PHOTOGRAPHY by Hillary G. Bailey, F.R.P.S. Posing, lighting, and exposure for portraiture, table-top, etc.

No. 13—FLASH PHOTOGRAPHY by Rus Arnold. Flash equipment, synchronization, exposure, indoor and outdoor work at night or in daytime, etc.

No. 14—PHOTOGRAPHING ACTION by Victor De Palma. Selecting shutter speed for motion. Special discussion of action photography outdoors and indoors.

No. 15—MANUAL OF ENLARGING by Stephen White, A.R.P.S. Complete guide to projection printing, printing technique, paper etc.

No. 16—MINIATURE CAMERA TECHNIQUE by Fenwick G. Small. Discusses miniature cameras, special technique in shooting, finegrain developing, printing, etc.

No. 17—PHOTOGRAPHIC LENSES AND SHUTTERS by Richard W. St. Clair, A.R.P.S. Photographic optics; camera lenses; auxiliary lenses and shutters, etc.

No. 18—PHOTO TRICKS AND EFFECTS by Jacob Deschin, A.R.P.S. Montage, double exposure, solarization, and other odd effects obtained by photography.

No. 19—SELLING YOUR PICTURES by Kurt S. Safranski. Markets, saleable material, legal aspects, and numerous hints on making money with your camera.

No. 20—DARKROOM HANDBOOK—AND FORMULARY by Morris Germain, A.R.P.S. Formulas for film and paper developers, fixing baths, intensifiers, reducers, toners; darkroom plans, equipment, technique, etc.

NO MATTER what photographic problem confronts you, you'll find the *correct* answer in one of the twenty *authoritative* volumes comprising the Photographic Series of the LITTLE TECHNICAL LIBRARY! Yes, these *fascinating* text books, by the publishers of Popular Photography, bring the *exact* information you need about photography indoors or outdoors, still or movie, black-and-white or color. *Profusely* illustrated, *richly* bound and *beautifully* printed, each handy *pocket-size* volume is authorized by an *outstanding* photographic expert! For "prize-winning" shots twelve months of the year, plan *all* your pictures with the Photographic Series at your fingertips. Get acquainted with these gems of camera information *now!* Go to your favorite book or camera store *today*, or tomorrow *sure*—or

MAIL CONVENIENT COUPON AT ONCE!

LITTLE TECHNICAL LIBRARY, Dept. B541
608 South Dearborn Street, Chicago, Ill.

Please send me the books of the PHOTOGRAPHIC SERIES whose numbers I have circled below. If I am not completely satisfied, I have the privilege of returning them within five days for refund in full.

1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20

☐ Send the complete set (20 volumes). Enclosed $....
☐ Send C.O.D. postage added. (C.O.D. in U.S.A. only)

NAME .....
ADDRESS .....
CITY & STATE.....
(60c each outside of U. S. A.—Payment with order)

face cards would not only serve this purpose but would teach plane silhouettes . . .

WALTER C. KIPLINGER.

Marshall, Mich.

END

Bottleneck in Brains

(*Continued from page* 62)

years ahead—is unpredictable. The emphasis then, naturally, will be more upon flying as transportation and avocation.

A boom in airline expansion seems likely, then, judging by recent airline extensions and a request by the Government for airlines to withhold expansion for the duration of the present emergency. A war decided mostly in the air, too, likely will result in developing air-minded populations which would result in more airline travel and flying for sport. Plants would be geared to plane production and brains now attuned to defense needs would be diverted to progress in civilian aviation.

The permanency of employment for aeronautical engineers and mechanics is further assured by the plan to maintain a permanent force of 20,000 or more fighting aircraft. As pointed out by Major Moseley, the replacement program alone for such a force would insure a fairly constant demand for aeronautical brains—not to mention the maintenance of the many air bases the United States is building and acquiring.

To put the conclusions reached in a nutshell:

1. As America embarks on a gigantic aerial armament program, a shortage, or bottleneck, of aeronautical engineers and mechanics does evidently exist.

2. Private aviation schools and engineering departments of universities are supplying the engineers and mechanics, with the private schools offering the best hope for cracking the bottleneck in a short enough time.

3. Employment of aeronautical engineers and mechanics appears secure and lucrative in both the immediate and far future because of

a) The defense program.

b) Maintenance and replacement program for an air force after its establishment.

c) Probable expansion of civilian aviation activity at the end of the present emergency.

END

Test Tube Aces

(*Continued from page* 30)

By such means the recruits are taught how to use oxygen equipment, effects of lack of oxygen, improvement in human performance and increased altitudes as a result of using oxygen, effects of diminishing atmospheric pressure, effects of various lengths of exposure at various altitudes, practice in rapid rates of ascent and descent.

The reports of all investigations by the clinical unit are correlated with the reports of psychologists who have made studies on the same men at the various training schools, particularly in respect to those who have had to cease training, those showing proneness to flying accidents, slowness in training, etc. These correlation studies may soon make it possible to place the work on a practical basis for selection purposes.

The information is also of value for the future, because it is admitted, a certain number of aircrew men are going to break down physically and mentally as a result of the severe strain of active service. With correlation of practical results with these investigation results, the air force will be in a position to regulate the activities of the men suspected of future breakdown.

The results also are of importance for the records of the Department of Pensions and National Health, and any saving made by adequate selection will result in the saving of lives and pensions at a later date. Cardiologists will be enabled through these records to follow many of these young men through the progressive age groups. It is estimated that when the system is put into operation for the entire flying personnel to be trained for the Empire's air forces, it will be the greatest record in existence about the cardiac conditions, normal and abnormal, of the young adult. Such information may be the key to a better appreciation of the conditions as seen in middle age, an important advance in the broader realm of science and medicine.

END

Canadian Combine?

VISIONS of a single company flying Canada's northland from Atlantic to Pacific and using this territory as a base for flights by way of Alaska to Asia, are seen in the reported purchase by the Canadian Pacific Railway of six of the largest northern Canadian air transport operators with services from Quebec to the Yukon. The Canadian Pacific Railway is reliably reported to have bought controlling interest in Yukon Southern Air Transport, operating from Vancouver and Edmonton by way of northern British Columbia to Dawson, Yukon Territory; Ginger Coote Airways, operating on Vancouver Island; Mackenzie Air Service, operating from Edmonton along the Mackenzie River to Aklavik and other posts north of the Arctic Circle; to be negotiating for purchase of Wings Ltd., Starratt Airways and Airways Ltd., all operating in northern Ontario and northern Manitoba.

The Canadian Pacific already has control of Canadian Airways Ltd., a company operating northern services from Quebec to the Mackenzie River. The purchase of the other lines will eliminate much competition which in recent years has driven freight and passenger rates down, as well as provide unified service. The Canadian Pacific Railway has had an eye on aviation for many years, but decision of the Canadian government that inter-city air transport shall be publicly owned has left the Canadian Pacific out of the growingly lucrative air transport business. With Canadian Airways Ltd., an estate sale over a year ago, Canadian Pacific had its main entry into the business, now is reported

PARTNERS IN THE BUSINESS OF DEFENSE!

WHEN it comes to national defense, one *trained man* is worth a dozen untrained men!

That's true of America's armed forces—and it's true of America's industry! Today, business and industry are crying for skilled, trained manpower! Never was opportunity greater for the alert, ambitious man who has mastered his line of work through study and practice!

Yes, the *trained man in uniform* and the *trained man in industry* are "partners in the business of defense." Whether you're serving Uncle Sam in barracks or factory, farm or office, additional TRAINING can make you a more valuable citizen and a real asset to your country!

Before you turn this page—tear off this coupon, mark it and mail it—just as thousands of successful men have done!

INTERNATIONAL CORRESPONDENCE SCHOOLS 1891★1941

BOX 5848-B, SCRANTON, PA.

Without cost or obligation, furnish me with information on course before which I have marked X:

☐ Air Pilot
☐ Aviation Mechanic
☐ Airplane Maintenance
☐ Aviation Engines
☐ Aviator
☐ Airplane Drafting
☐ Ship Draftsman
☐ Ship Fitter
☐ Electrician
☐ Blue-print Reading
☐ Mold Loft Work
☐ Tool Designer
☐ Sheet Metal Worker
☐ Toolmaker
☐ Boilermaking
☐ Fundamentals of Aeronautical Engineering

Name _____ Age ____

Address _____

City _____

State _____

The 1941 Directory of Photographic Equipment

WHAT IS THE SPEED OF THAT FILM?
WHERE CAN I FIND THE MAKER'S ADDRESS?
HOW DO THESE PROJECTORS COMPARE?
WHAT ENLARGERS ARE EQUIPPED FOR COPYING?
HOW MANY PRINTING PAPERS ARE THERE?
HOW MUCH DOES THAT PRINTER COST?
WHICH CAMERA SHOULD I BUY?

BRINGS YOU ALL THE ANSWERS

THIS INVALUABLE BUYING GUIDE OF PHOTOGRAPHIC EQUIPMENT COMES AS AN EXTRA FEATURE OF THE GIANT MAY ISSUE AT NO EXTRA COST TO YOU! IT'S COMPLETE, RELIABLE, ILLUSTRATED!

Camera fans! *Now* you can forget doubts and questions in selecting your photographic equipment! *Now*, right at your very fingertips, you can have the most *comprehensive* buying guide of cameras and supplies ever assembled. Yes, POPULAR PHOTOGRAPHY'S *new* 1941 Directory of Photographic Equipment, *bigger and better than ever*, makes it *easy* for you to compare similar products of all the different manufacturers.

DESCRIBES ALL KINDS OF EQUIPMENT!

You'll be *amazed* to see how many cameras are on the market, as compared with just a few years ago. You'll be *surprised* to learn about the number of gadgets that are *now* being made to help the photographer obtain results with greater ease. But this valuable Directory is not confined to cameras and gadgets . . . it extends to films, filters, flashbulbs, etc. (Note complete listing to the right.)

AS HANDY TO USE AS THE TELEPHONE BOOK!

Imagine what a help this *illustrated* Directory can be to *you!* Each type of equipment—cameras, projectors, enlargers, etc.—is *classified together*. In the case of items such as films all the characteristics and speed ratings are given. In the camera listing you will find the trade name and model, film dimensions, lens equipment, shutter speeds, available accessories, and other pertinent information. Retail prices are also quoted for each item together with the name and address of the maker or distributor. And what's more, the convenient *alphabetized* index enables you to find, *instantly*, the exact item you are looking for. Yes, with this illustrated Directory you can sit in your armchair at home and "inspect" all of the photographic equipment that would take days in a camera department to see!

MAKE SURE OF YOUR DIRECTORY ISSUE NOW!

Remember, this *invaluable* buying guide of photographic equipment comes as an *extra* feature of the *giant* May POPULAR PHOTOGRAPHY at *no extra cost!* The print order of this spectacular Directory issue is *limited*, however, so don't get shut out. Act *promptly!* Go to your favorite newsstand or camera store *today* and get *your* copy!

COMPLETE DIRECTORIES ON THESE SUBJECTS

- Cameras, Movie
- Cameras, Still
- Enlargers
- Enlarging Easels
- Exposure Meters
- Films, Movie
- Films, Still
- Filters
- Flashbulbs
- Flash Synchronizers
- Front Lenses
- Lenses, New
- Movie Editing and Titling Equipment
- Print Dryers
- Printers
- Printing Exposure Meters
- Printing Papers
- Projector Screens
- Projectors, Movie
- Projectors, Still
- Rangefinders
- Spotlights

GIANT DIRECTORY ISSUE

Popular Photography

NOW ON SALE AT ALL NEWSSTANDS AND CAMERA STORES! 25c

to be spending $12,000,000 to consolidate northern air services and then run an airway out of Vancouver via Alaska to Siberia, Moscow and Shanghai, as part of its world-wide ocean service.

END

Fuel for Defense

(*Continued from page* 36)

Commission has earnestly recommended creation of a storage pool for aviation gasoline, that "the Navy's share in the cost of establishing storage facilities for that pool of 7,500,000 barrels is $2,500,000 and that the Army would put up $5,000,000."

The R. F. C. would finance purchase of the aviation gasoline stocks. Further explanation of the project indicated that the R. F. C. would purchase the gasoline while the Army and Navy would finance the storage to care for it. As the services buy the aero fuel, the R. F. C. will acquire additional fuel to replace it in storage.

At present, Secretary Knox explained, the capacity of the industry to produce 100 octane gasoline is considerably in excess of peacetime requirements, but short of wartime demands. The pool to be established will represent a 100-day wartime reserve supply (for the 50,000 planes?).

The R. F. C. end of the revolving pool project will be self-liquidating; the loan agency making a surcharge to the Army and Navy for the gasoline they require.

END

Warning, Joy Riders!

OFFICIALS of the Civil Aeronautics Administration caution would-be passengers to observe certain safety measures before accepting a ride with a hospitable pilot. It is pointed out that 42 per cent of all civil non-scheduled flying accidents while carrying passengers occurred when a student pilot was at the controls. The C.A.B. consequently urges every prospective passenger in aircraft of this category to request to see the pilot's license. According to law, every pilot must carry his license at all times —and he *cannot* carry passengers, either for hire or not for hire, unless he has a private or commercial license. If a pilot says his license is home in his other suit —don't ride with him until you are absolutely sure that he is telling the truth. Remember, your life may be at stake.

Douglas Expands Training

TRAINING of men for America's defense is being expanded and accelerated by the Douglas Aircraft Company. The education department of the company's personnel division is waging upon every possible front a training offensive designed to assist employes and non-employes in acquiring and furthering the technical skills so essential to the nation's air defense.

Trade schools, colleges and high schools, NYA and CCC all are stepping up their aviation training programs in California. Under Director C. T. Reid, the Douglas education department is cooperating closely in the outlining of preemployment aircraft courses, in many cases furnishing instructors and study materials.

"Total defense is more than airplanes, factories and machines. A backlog of well-trained, efficient workers is a prime asset for our national security and we as an industry are devoting our efforts toward training and supplying manpower as well as aerial gun and bomb power," Donald W. Douglas, president, said.

Frequent addresses are now being made by Douglas representatives before groups interested in the design and construction of airplanes and the industry's vocational needs and requirements. Trade extension courses offered to Douglas workers have been more than doubled in scope and number. Approximately 800 employes were enrolled last year, while nearly 2,000 are expected in the fall.

Plenty Light

THE new national airport at Washington, D. C., will have the largest amount of lighting ever installed in one airport. The Westinghouse company is filling the contract totalling approximately $100,000 for some 400 contact lights of different colors for traffic and landing control, boundary lights, obstruction, range and floodlights. Also in that contract is the airport beacon, a ceiling projector light and interior fixtures for the administration building and hangars. Replacing the conventional wind tee will be a "smoke pot" wind indicator.

REAL ENGINE VALUE

G. H. Q. GAS ENGINE

NOW ONLY $4.95

A large bore engine at a lower price than any small bore engine.

This is a miniature gasoline engine that really operates. Mass production methods and enthusiastic reception have enabled us to reduce the price from $35.00 originally to the NEW LOW PRICE OF $4.95. Over 15,000 sold in the last year—over 50,000 in use today. THE NEW IMPROVED 1941 MODEL KIT IS ABSOLUTELY COMPLETE with coil, condenser, plug, simple illustrated instructions, gas tank, etc.

For Model Planes, Boats, Midget Cars, etc.

All Parts Finished and Guaranteed. All Machining Done. No Mechanical Knowledge Required. 1/5 Horsepower—NAA Class C Engine

Average assembly time 30 minutes. ONLY A SCREW DRIVER NEEDED

FACTORY ASSEMBLED READY-TO-RUN $6.50

Dealers Wanted

Send for FREE literature on G. H. Q. Gas Engine or 6c for Jumbo catalog.

SEND ONLY $1.00 Shipped Collect C.O.D. Same Day

G. H. Q. MOTORS, Dept. P, 40 E. 21st, New York

FREE with every Purchase! FIREWORKS

COMPARE OUR PRICES BEFORE YOU BUY

One Cent POSTCARD will SAVE YOU MANY DOLLARS!

1¢ Send for NEW 1941 FREE CATALOG

$6.55 Liberty Bell ASSORTMENT Over 1300 Pieces $2.85 NET

Your Dollar Buys TWO Dollars Worth at

BALTIMORE FIREWORKS CO., INC.

6560 EASTERN AVE BALTIMORE MARYLAND

Which of these best-selling aviation books do you need?

If you fly or want to fly . . . If you build, repair, or maintain airplanes . . . If aviation is your livelihood or your hobby, these books are a good investment. Over a quarter-million copies now in use prove it!

The standard books on flying the world over by
ASSEN JORDANOFF
Famous aviation authority—pilot, instructor, technician, and consultant to leading American airlines since 1921.
THROUGH THE OVERCAST
YOUR WINGS

REVISED ENLARGED EDITION

YOUR WINGS

The Manual of Flight

Complete flying and ground school, **460 specially-made illustrations.** You see as well as read how to pilot a plane . . . All about motors, radio instruments, navigation, etc. Meets latest C.A.A. requirements. Has been translated into eight languages. Size 7" x 9½". $2.50.

THROUGH THE OVERCAST

Weather, and the Art of Instrument Flying

C. R. Smith, President of American Airlines, says: "This book has made the subject of meteorology simple to understand." Describes and illustrates newest instruments, radio, and all allied subjects. Size 7" x 9½". Over 300 illustrations. $5.00

SEND NO MONEY

SEND NO MONEY

Tear out, sign and mail to FUNK & WAGNALLS COMPANY Dept. 165, 354 Fourth Ave., N.Y.C.

Send me the books I have checked below.

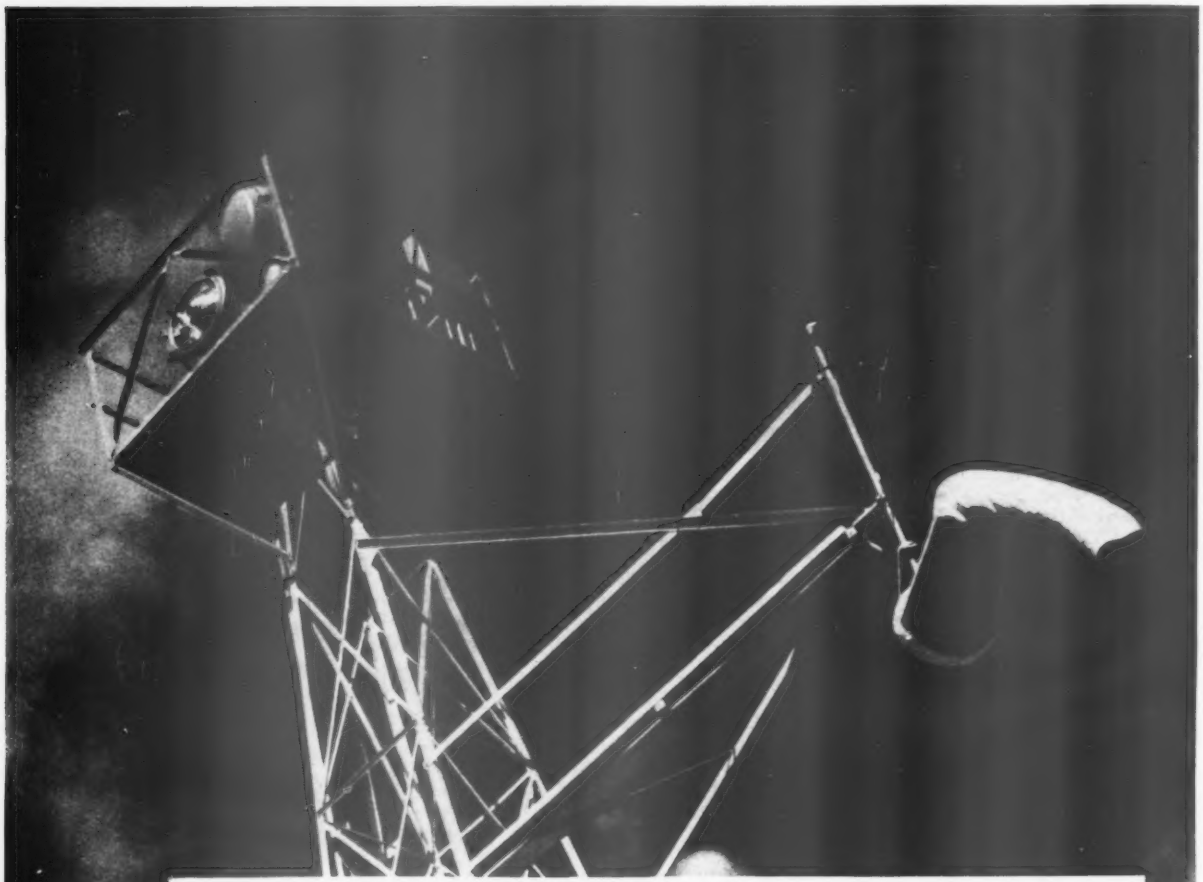
☐ YOUR WINGS, $2.50
☐ THROUGH THE OVERCAST, $3.00
☐ BOTH BOOKS, BOXED, $5.00

I will deposit price with postman on delivery. I understand that I may return either or both books within 10 days for full refund.

NAME .....

ADDRESS .....

.....



AOPA . . . THE "BEACON" OF NON-SCHEDULED FLYING PROGRESS!

HOW is AOPA helping to make flying more useful, less expensive, safer and more fun for non-scheduled pilots?

Witness its potent campaign for lower rates on life and accident insurance policies; for air markings in every U. S. town; for removal of all airport obstructions; for more landing areas; for preventing unnecessary curtailment of non-scheduled flying.

Then note how AOPA has reduced flying costs and serviced flying problems for registered AOPA pilots; instituted effective legislative representation; conducted the largest flight activities in history.

Are you registered with AOPA, the largest and most progressive pilots' organization of its kind in America? If not, you're missing one of the greatest opportunities in non-scheduled flying today.

A special illustrated folder describing how you, too, can reap the many benefits and valuable services offered by AOPA for less than 2c a day is yours for the asking. Just fill out and mail convenient coupon below.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION

OFFICE OF PRESIDENT
1424 Walnut St., Philadelphia, Pa.

NATIONAL SERVICE OFFICE
Transportation Building, Chicago, Illinois.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION
National Service Office, Dept. 541,
Transportation Bldg., Chicago, Ill.

Please send me at once your special illustrated folder describing how I can reap the many benefits and valuable services offered by AOPA for less than 2c a day.
(Sent only to private aircraft owners or non-scheduled pilots who have soloed.)

NAME .....

ADDRESS .....

CITY & STATE.....

FLYING and POPULAR AVIATION USED PLANE LISTING OF AUTHORIZED AIRCRAFT DEALERS

The world's largest selection of used aircraft is listed in this special reader service section. Fine used airplanes in good licensed condition, some with hardly any time at all, many with but a few hours since overhaul. Each plane selected by an expert who has the mark of factory approval due to the fact he is an AUTHORIZED AIRCRAFT DEALER. These are ships you can buy to fly. Select any one of them, they are all real buys, and can be purchased just as you purchase your car.

ALL AIRCRAFT LISTED ARE LICENSED

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
AERONCA					
Arthur J. Davis, E. Lansing, Michigan	Chief	Cont. 65	2 hr	New	$1940
W. A. Crews, 1201 W. Ash, Blytheville, Ark.	Chief 1939	Lyc. 65	500 hr.	Major 400 hr.	1600
G. E. Verhostra, 2010 Hollywood Place, So. Bend, Ind.	Chief '41	Lyc. 65	25 hr.	New	1595
Sky Harbor, Inc., R.R. No. 11, Box 551, Indianapolis, Ind.	Chief '40	Lyc. 65	400 hr.		1500
Leeward Aviation, New Kensington, Pa.	Chief 1939	Cont. 65	60 hr.	New	1450
G. E. Verhostra, 2010 Hollywood Pl., So. Bend, Ind.	Chief '40	Lyc. dl. 65	200 hr.	Dem.	1400
Lenhart Flying Serv. Arpt., Marion, Ind.	TF	Frank. 65	12 hr.		1395
Morristown Fly. Club, Morristown, Tenn.	Chief '40	Lyc. 65	362 hr.	No	1375
Mtn. States Avia., Inc., 3800 Dahlia St., Denver, Colo.	Chief	Cont. 65	540 hr.	None since overh'l	1350
Falcon Aircft. Corp., L.A. Mun. Arpt., Inglewood, Calif.	LB	LeBlond 85	501 hr.	Major 150 hr.	1350
Lane Air Service, Albany, Ga.	Chief Deluxe	Cont. 65	375 hr.	Recently	1300
Florida Aero & Supply Co., Cannon-Mills Fld., Orlando, Florida	Tandem Trainer	Lyc. 65	280 hr.	No	1300
W. A. Crews, 1201 W. Ash, Blytheville, Ark.	Trainer (new)	Lyc. 65	15 hr.	15 hr.	1300
G. E. Verhostra, 2010 Hollywood Pl., So. Bend, Ind.	Tandem Tr.	Lyc. dual 65	25 hr.	Dem.	1300
Lenhart Flying Serv., Arpt., Marion, Ind.	TL	Lycoming 65	176 hr.		1295
C. W. Peterson, Mun. Arpt., Salina, Kansas.	Chief	Cont. 65	315 hr.	None	1275
Tred Avon Fly. Serv., Inc., Easton, Md.	Tandem Tr.	Lyc. 55	275 hr.	No	1275
G. E. Verhostra, 2010 Hollywood Pl., So. Bend, Ind.	Tandem Tr	Lyc. dual 65	45 hr.	Dem.	1275
Roscoe Turner, Aeronautical Corp., Ind., Ind.	Chief	Cont. 65	300 hr.	Top	1275
Lenhart Flying Serv., Arpt., Marion, Ind.	TL	Lycoming 65	192 hr.		1250
Inter-City Avia., Inc., Boston Mun. Arpt., E. Boston, Mass.	Chief	Lyc. 65	825 hr.	210 hr. since	1250
Mtn. States Avia., Inc., 3800 Dahlia St., Denver, Colo.	Chief	Cont. 65	720 hr.	30 hr.	1250
Pierce Flying Serv., Box 894, Eureka, Calif.	65-TC	Cont. 65	650 hr.	100 hr.	1250
G. E. Verhostra, 2010 Hollywood Place, So. Bend, Ind.	Trainer	Lyc. dual 65	75 hr.	Dem.	1225
Blvd. Arpt., Inc., Roosevelt Blvd. & Red Lion Rd., Philadelphia, Penna.	Chief	Lyc. 55	240 hr.	No	1200
St. Louis Fly. Serv., Lambert Fld., Robertson, Mo.	RCA	Cont. 50		Recently	1175
Tred Avon Flying Service, Easton, Md.	Tandem Tr.	Lyc. 50	85 hr.	No	1175
H. S. Smith, 422 S. Union St., Warsaw, Ind.	KC	Lyc. 50	567 hr.	Topped	1175
Blvd. Arpt., Inc., Roosevelt Blvd. & Red Lion Rd., Philadelphia, Penna.	Trainer	Lyc. 55	150 hr.	New	1150
Springfield Avia. Co., Mun. Arpt., Springfield, Ill.	Tandem Tr.	Frnkln. 60	303 hr.	No	1150
Four Lakes Avia. Corp., Royal Arpt., Madison, Wisc.	LB	LeBlond 85	480 hr.	405 hr.	1125
J. A. Atherton, Arpt., Rochester, Minn.	Trainer	Lyc. 65	240 hr.	Yes	1100
Knox Flite, Mun. Arpt., Knoxville, Tenn.	Chief 50LA	Lyc. 55	400 hr.	6 hrs.	1075
Art Whitaker, Swan Island Arpt., Portland, Ore.	Trainer	Lyc. 65	700 hr.	500 hr.	1075
C. W. Peterson, Mun. Arpt., Salina, Kansas.	LB	LeBlond 90	485 hr.	Recently	1050
McBoyle Cub Sales, Arpt., Spring Green, Wisc.	Chief	Cont. 50	950 hr.	587 hr.	1000
Edwards Fly. Serv., Inc., Flushing Arpt., L.I., N.Y.	Chief	Cont. 50		150 hr.	1000
New Mex. Fly. Serv., Box 67, Clovis, N. M.	Tandem	Lyc. 65	500 hr.	426 hr.	1000
Lenhart Fly. Serv., Munic. Arpt., Marion, Ind.	Tr.	Frnkln. 60	340 hr.	300 hr.	995
United Aero Corp., P.O. Box 222, San Antonio, Texas	Chief	Frnkln. 50	1346 hr.	1335 hr.	990
Un. Aero Corp., P.O. Box 222, San Antonio, Texas	Tandem Tr.	Frnkln. 50	600 hr.	Just	975
United Aero Corp., P.O. Box 222, San Antonio, Texas	Trainer '40	Frnkln. 60	612 hr.	612 hr.	975
Lenhart Flying Serv., Arpt., Marion, Ind.	TF	Frnkln. 60	365 hr.	310 hr.	950
Jenkins Air Serv., Mun. Arpt., Rochester, N.Y.	60TF	Frnkln. 60	580 hr.	526 hr. Major	950
Midwest Flyers, Lakeside Arpt., E. St. Louis, Ill.	Trainer	Frnkln. 60	550 hr.	Jan. '41	950
R. D. Finefrock, Box 301, Tyler Texas	Chief '38	Cont. 50	500 hr.	Just relic.	950
United Aero Corp., P.O. Box 222, San Antonio, Texas	Chief '40	Frnkln. 50	1700 hr.	1698 hr.	925
Southern Arwys. Sales Co., Mun. Arpt., Birmingham, Ala.	'38	Cont. 50	300 hr.	290 hr.	900
Edwards Fly. Serv., Flushing Arpt., Flushing, L.I., N.Y.	Trainer	Frnkln. 60	260 hr.	10/24/40	$ 875
Jones Fly. Serv., Sullivan Av. Arpt., Cols., O.	K	Frnkln. 50	680 hr.	Fact. 150 hr.	875
Southern Airways, Mun. Arpt., Brimingham, Ala.		Cont. 50	360 hr.	350 hr.	850
J. S. Barham, Airport, Santa Rosa, Calif.	K	Aeronca	380 hr.	No	700
Aircraft Assoc., Inc., Mun. Arpt., Long Beach, Calif.	K	Aeronca 40	815 hr.	65 hr. since major	650
Tred Avon Fly. Service, Easton, Md.	KC	Cont. 40	680 hr.	Just	650
Oakland Aircraft Corp., Alameda, Cal.	K	Aero. 40	730 hr.	Oct '39	650
Florida Aero & Supply Co., Cannon-Mills Fld., Orlando, Florida	K	Aeronca 40	625 hr.	200 hr.	625
Pierce Fly. Serv., Box 894, Eureka, Calif.	C-3 '35	Aeronca 36	1500 hr.	Just major	600
Aero-Ways, Inc., Mun. Arpt., Cleveland, O.	K	Aeronca 40	328 hr.	Just relic.	600
Hawthorne Fly. Serv., Mun. Arpt., Charleston S.C.	K	Aeronca 40	583 hr.	Just completed	595
Tred Avon Fly. Serv., Easton, Md.	K	Aeronca 40	580 hr.	After 482 hr.	595
Baker-Eberle Avia Co., City Arpt., Detroit, Mich.	K	Aeronca E113C	800 hr.	Now	575
Aviation Market, L.A. Metro Arpt., Van Nuys, Calif.	K	Aeronca 40	930 hr.	Yes	575
Lane Air Serv., Albany, Ga.	K	Aeronca 43	550 hr.	Recently	550
E.H. Brockenbrough, Mun. Arpt., Charlotte, N.C.	KC	Cont.	488 hr.	88 hr.	550
Leeward Aviation, New Kensington, Pa.	C-3	E113-C 40 h.p.	360 hr.	Yes	545
Baker-Eberle Avia. Co., City Arpt., Detroit, Mich.	C-3	E113-C 40 h.p.	1200 hr.	80 hr.	400
ARROW SPORT					
E. R. Elliott, 5th & Sherman, Coeur d'Alene, Ida.	Sport	V-8	196 hr.		650
Aero-Ways, Inc., Mun. Arpt., Cleveland, O.	Sport	V-8	520 hr.		525
Boulevard Arpt., Inc., Roosevelt Blvd. & Red Lion Rd., Philadelphia, Penna.	Sport	V-8	550 hr.	400 hr.	500
BEECHCRAFT					
Lambert Aircraft Sales, Box 261, Robertson, Mo.	F17D	Jacobs 330	370 hr.	Just	10750
E. W. Wiggins Arwys., Inc., Providence, R. I.	C-17-B	Jacobs 285	600 hr.	Recently	4800
Lambert Aircraft Sales, Box 261, Robertson, Mo.	C17B	Jacobs 285	650 hr.	50 hr.	3875
Rochester Aeron. Corp., Rochester Arpt., Rochester, N. Y.	1935	Jacobs 225	735 hr.	50 hr.	2100
BIRD					
Edwards Fly. Serv., Inc., Flushing Arpt., Flushing, L. I., N. Y.	4 Pl.	Kinner 125		Newly	1500
Lane Air Serv., Albany, Georgia	Deluxe	Kinner 100 h.p.	900 hr.	Just	1250
Florida Aero & Supply Co., Cannon-Mills Fld., Orlando, Florida		Kinner 90 h.p.	1500 hr.	250 hr.	795
CESSNA					
Atlantic Avia. Serv., Duport Arpt., Wilmington, Del.	Airmaster	Warner 165	257 hr.	New	6255
DuBois Avia. Assoc. Arpt., DuBois, Pa.	C-37	Warner 145	497 hr	50 hr.	2990
Walter D. Mauk, Mun. Arpt., Blackwell, Okla.	C-34	Warner 145	1310 hr.	1250 hr.	2400
Bob Wight, Box 487, Biloxi Miss.	AW	Warner 125	495 hr.	Just relic.	700
CULVER CADET					
Port Columbus Fly. School, Pt. Columbus, Columbus, Ohio	LCA	Cont. 75	45 hr.	New	2000
New Mexico Fly. Serv., Box 67, Clovis, N. M.		Cont. 75	77 hr.		1900
CURTISS ROBIN					
McBoyle Cub Sales, Arpt., Spring Green, Wis.	Thrush	Wright J69	Being overhauled and recovered		1650
Geo. Roper, 27 S. State, Salt Lake City, U.		Challenger	800 hr.	Mar. '40	800

FLYING and POPULAR AVIATION USED PLANE LISTING OF

DEALERS	MODEL AND ENGINE	TIME	OVER-HAULED	PRICE
A. A. Goldsmith, Nashua, N. H.	Wright J65	700 hr.	150 hr.	$ 700
Pt. Columbus Fly. School, Pt. Columbus, Columbus, Ohio	Robin Challenger 185	750 hr.		650
Red Bank Arpt., Inc., Red Bank, N. J.	Robin Challenger 185	545 hr.	235 hr.	650
Un. Aero Corp., P.O. Box 222, San Antonio, Texas	Robin Challenger 185	518 hr.	237 hr.	625
St. Louis Fly. Serv., Lambert Fld., Robertson, Mo.	Robin Tank 115	208 hr.	Recently	475
H. W. Haver, Lebanon, N. J.	Robin Chall. 185	600 hr.	May	450
DART				
Ashcraft Bros. Fly. Serv., Mun. Arpt., Lawrence, Kans.	Dart Ken Royce 90	360 hr.	300 hr. top overh'l	2000
DAVIS				
Arthur J. Davis, E. Lansing, Mich.	125 Warner 125	540 hr.	Yes	950
New Mexico Fly. Serv., Box 67, Clovis, N. M.	D-1 LeBlond 60	700 hr.		650
Lane Air Service, Albany, Ga.	LeBlond 65	450 hr.	Recently	500
FAIRCHILD				
Inter-City Avia., Inc., Boston Mun. Arpt., E. Boston, Mass.	24 Warner 145	400 hr.		6490
Atlantic Aviation Serv., Dupont Arpt., Wilmington, Del.	24 Warner 145	357 hr.	New	5950
Carolina Aircraft Sales, Mun. Arpt., Charlotte, N. C.	24 Warner 145	130 hr.	New 30 since	5500
Inter-City Avia., Inc., Boston Mun. Arpt., E. Boston, Mass.	24 Ranger 165	860 hr.	Major 30 hr.	4950
Leech Aircraft, Inc., Roosevelt Fld., Mineola, N. Y.	1938 Ranger 165	375 hr.	top	4000
Atlantic Avia. Serv., Dupont Arpt., Wilmington, Del.	24 Warner 145	418 hr.	134 hr.	3950
T. A. Colbertson, Medfort, Oregon	246 Warner 145	800 hr.	350 hr.	3500
Decatur Avia. Co., 776 S. Maffit St., Decatur, Illinois	R24 Ranger 145	690 hr.	275 hr.	2900
Cutter Carr Fly. Serv., P.O. Box 274, Albuquerque, N. M.	24 Warner 145	700 hr.	220 hr.	2750
Jos. R. Higgins, Mozart Park, Wheeling, W.Va.	24 Ranger 145	790 hr.	10 hr. since major	2500
Art Whitaker, Swan Island Arpt., Portland, Ore.	24 Delx Ranger 150	560 hr.	60 hr. since top	2500
E. W. Wiggins Airways, Inc., Providence, R. I.	24 Ranger 145	700 hr.	Jan. '40	2500
John P. Hall, W. Haven Arpt., W. Haven, Conn.	24 Warner 145	348 hr.	Just topped	1650
E. W. Wiggins Airways, Inc., Boston Met. Arpt., Norwood, Mass.	24 Warner Series 40 125 h.p.	945 hr.	305 hr. since major	1350
Doug Schall, 33 Claggett Rd., Hyattsville, Md.	KR-34 Wright 165	700 hr.	10 hr.	1175
Art Whitaker, Swan Island Arpt., Portland, Ore.	24 Inverted 2 place Cirrus	900 hr.	900 hr	1125
Lambert Aircraft Sales, Box 261, Robertson, Mo.	42 Wright J69	1160 hr.	160 hr.	1095
Calif. Aircraft Corp., P.O. Box 170, Van Nuys, Calif.	22-C-7 Rover 75	1000 hr.	200 hr.	985
Piedmont Avia., Mun. Arpt., Winston-Salem, N. C.	KR-34 Wright 165	692 hr.	82 hr.	895
FLEET				
West Coast Aircraft, L.A. Airport, Inglewood, Calif.	2 Kinner KB-5		Recently	1650
H. A. Hammill, Box 982, Austin, Texas	Warner 125	700 hr.	35 hr.	1500
St. Louis Fly. Serv., Lambert Fld., Robertson, Mo.	1 Warner Scarab 125	892 hr.	Recently 174 hr.	895 750
GREAT LAKES				
Hudson Valley Aircraft, Inc., 60 Dolson Ave., Middletown, N. Y.	American Cirrus Mark III 90 h. p.	320 hr.	Nov. '40	850
Sky Harbor, Inc., R.R. No. 11, Box 551, Indianapolis, Ind.	2TIA Cirrus 100	650 hr.	Aug. '40	800
KINNER				
Calif. Aircr. Corp., P.O. Box 170, Van Nuys, Calif.	Sportster Kinner K5, 125	1000 hr.	just	985
LUSCOMBE				
Calif. Aircr. Corp., P.O. Box 170, Van Nuys, Calif.	Phantom Warner 90	300 hr.	No	2985
Carl Evers, 247 Park Ave., N. Y., N. Y.	Silvaire 75 Cont. 75	Exhibit	ship	2650
Aircraft Sales Corp., 1143 Diversey, Chicago	Silvaire Cont. 75	82 hr.		2350
Arents Air. Serv., Armonk Village, N. Y.	Silvaire Cont. 75	500 hr.		2250
Falcon Aircraft Corp., L.A. Mun. Arpt., Inglewood, Calif.	8A Cont. 65	350 hr.		2200
Midwest Fly. Serv., Inc., Stinson Arpt., La Grange, Illinois	8B Lyc. 65	65 hr.		2000
R. C. Davis, 328 N. Adams St., Glendale, Cal.	8A Cont. 65	135 hr.	None	2000
C. W. Peterson, Mun. Arpt., Salina, Kansas	8A Cont. 65	36 hr.		1995
Aircraft Unlimited, Roosevelt Fld., Mineola, N. Y.	'40 Seaplane Cont. 65	90 hr.		1900
Aircraft Unlimited, Roosevelt Fld., Mineola, N. Y.	Silvaire Cont. 75	90 hr.		1900

DEALERS	MODEL AND ENGINE	TIME	OVER-HAULED	PRICE
C. W. Peterson, Mun. Arpt., Salina, Kansas	8B1 Lyc. 65	16 hr.	New	$1895
Air Serv., Inc., Mun. Arpt., Denver, Colo.	8A Cont. 65	84 hr.		1850
Arents Air Serv., Armonk Village, N. Y.	8A Cont. 65	575 hr.	575 hr.	1850
Arents Air Serv., Armonk Village, N. Y.	8A Cont. 65	625 hr.	600 hr.	1800
Midwest Fly. Serv., Inc., Stinson Arpt., La Grange, Ill.	8B Lyc. 65	33 hr.		1725
Midwest Fly. Serv. Inc., Stinson Arpt., La Grange, Ill.	8A Cont. 65	174 hr.		1700
Arcft. Unlimited, Roosevelt Fld., Mineola, N. Y.	'40 Cont. 65	90 hr.		1700
Jersey Fly. Serv., Oakland, N. J.	8A Cont. 65	90 hr.	None	1700
Sioux Skyways, Inc., Munic. Arpt., Sioux Falls, S. D.	8B Lyc. 65	250 hr.		1675
J. L. Wells, 106 W. Main, Avon Park, Fla.	8A Cont. 65	95 hr.	None	1675
Knox Flite, Mun. Arpt., Knoxville, Tenn.	8B Lyc. 65	200 hr.		1650
Midwest Fly. Serv., Inc., Stinson Arpt., La Grange, Illinois	8B Lyc. 65	115 hr.		1600
Sioux Skyways, Inc., Mun. Arpt., Sioux Falls, S.D.	8A Cont. 65	735 hr.		1550
MONOCOACH				
Carnahan Flyg. Serv., Arpt., Bloomington, Ill.	Wright	998 hr.	165 hr.	995
MONOCOUPE				
E. H. Brockenbrough, Mun. Arpt., Charlotte, N.C.	145 Warner 145	20 hr.	No	5900
Fla. Aero & Supply Co., Cannon-Mills Fld., Orlando, Fla.	Warner 125	945 hr.	240 hr.	1250
Bennett Air Service, P.O. Box 247, Hightstown, N. J.	6W Warner 125	1290 hr.	74 hr. since	1150
St. Louis Fly. Serv., Lambert Fld., Robertson, Mo.	90 Lambert 90		Recently	995
Oakland Aircraft, Alameda, Calif.	Lambert 90	688 hr.	Feb. '39	850
MOTH				
Carl Evers, 247 Park Avenue, N. Y., N. Y.	Gipsy Major 130		New	2800
NEW STANDARD				
Blvd. Arpt., Inc., Roosevelt Blvd. & Red Lion Rd., Philadelphia, Penna.	Kinner 90	1500 hr.	700 hr.	750
PIPER CUB				
Eddie Braden, Easton Arpt., Easton, Pa.	Coupe Dual Cont. 65	30 hr.		1950
Ben A. Funk, Hy. 50, Grover, Mo.	Seaplane J3L Lyc. 65	New		1925
Stiles Motor Co., 260 Main St., Northport, N.Y.	Coupe J4A Cont. 65	142 hr.	New	1900
L. L. Rupert, Box 446, Muskogee, Okla.	Coupe '40 Cont. Dual 65	155 hr.	Ext. Gas, Leather Uphd.	1850
Hudson Valley Aircraft Co., 68 Dolson Ave., Middletown, N. Y.	Coupe J4 Cont. 65	40 hr.	Oct. '40	1800
Southern Vt. Fly. Serv., Arpt., N. Springfield, Vt.	Cruiser Cont. 75	40 hr.	New	1750
N. Mex. Fly. Serv., Box 67, Clovis, N. Mex.	Cruiser Cont. 75	64 hr.	No	1725
Ken's Cub Flyers, Olean Arpt., Olean, N. Y.	Coupe J-4 Cont. 75	115 hr.	No	1700
EGerald W. Richardson, Pt. Erie Arpt. Erie, Pa.	Cruiser J5 Cont. 75	38 hr.	New	1695
Ellis E. Eno, Eno Arpt., Fort Dodge, Ia.	Cruiser Cont. 75	130 hr.	None	1650
John Ruzicka, Circus City Arpt., Peru, Ind.	Cruiser J5 Cont. 75	18 hr.	None	1650
M. F. Warrington, Cub Air Serv., Selbyville, Del.	Cruiser Cont. 1A-75	Brand new		1650
DuBois Avia. Assoc., Arpt., DuBois, Pa.	Coupe Cont. 65	89 hr.	No	1645
L-H Air Serv., Hatboro Arpt., Hatboro, Pa.	Coupe Cont. 65	250 hr.		1600
Lynchburg Air Transp. & Sales Corp., Preston Glenn Arpt., Lynchburg, Va.	Coupe '39 Cont. 65	175 hr.	No	1600
Tufts-Edgcumbe, Inc., Ravenswood Arpt., Des Plaines, Illinois	J-4 '40 Cont. 65	360 hr.	Just	1600
Skelly's Fly. Serv., Greenville Arpt., Greenville, Pa.	J-4 Cont. 65	100 hr.	New	1595
Racine Fly. Serv., Racine Arpt., Racine, Wisc.	J-4 Cont. 65	383 hr.	353 hr.	1575
R. E. B. Springer, Box 567, Waynesburg, Pa.	Coupe J4C Cont. 65	275 hr.	Checked 50 hr back	1550
Al Gillis Fly. Serv., 125-1st Ave. No., Great Falls, Mont.	Coupe '40 Cont. 65	200 hr.	None	1550
Tufts-Edgcumbe, Inc., Ravenswood Arpt., Des Plaines, Illinois	J-4 Cont. 65	540 hr.	100 hr.	1550
Jersey Fly. Service, Oakland N. J.	Cruiser J-5 Cont. 75	135 hr.	None	1550
Southern Air Serv., Memphis, Tenn.	Cont. 65	100 hr.	New	1550
Air City Fly. Serv., 5500 E. 3 St., Dayton, Ohio	Cruiser Cont. 75	150 hr.		1545
Al Gillis Fly. Serv., 125 1st Ave., No., Great Falls, Mont.	Coupe '40 Cont. 65 h.p.	350 hr.	None	1500
Lynchburg Air Transp. & Sales Corp., Preston Glenn Arpt., Lynchburg, Va.	Cruiser '40 Cont. 75	125 hr.	No	1500
J. L. Schroeder, Rt. 3, Box 117, Houston, Tex.	J-3 Cont. 65	72 hr.	New	1500
Desjardin Auto Serv., 24 Fairmount Ave., Worcester, Mass.	J-5 Cont. 75	100 hr.	New	1500
Safair, Inc., Roosevelt Field, Mineola, N. Y.	Coupe Cont. 65	290 hr.		1500
St. Louis Fly. Serv., Lambert Fld., Robertson, Mo.	Cruiser V5 Cont. 75	14 hr.		1495
Seidner Fly. Serv., S.A.M. Arpt., Youngstown, O.	Coupe Cont. 65	212 hr.	New	1495
Ben A. Funk, Highway No. 50, Grover, Mo.	J3L65 Lyc. 65	New		1477
Seidner Fly. Serv., S.A.M. Fly. Serv., Youngstown, Ohio	Cruiser Cont. 75	110 hr.	'40 mod.	1475
Bennett Air Serv., P.O. B. 247, Hightstown, N. J.	Cruiser J-5C Cont. Dual 75 h.p.	235 hr.	30 hrs. from Major	1475
Racine Fly. Serv., Racine Arpt., Racine, Wis.	J-4 Lyc. 65	330 hr.	top 320	1475
Lexington Fly. Serv., Mun. Arpt., Lexington, Ky.	Cruiser Cont. 75	190 hr.	No	1450

AUTHORIZED AIRCRAFT DEALERS

DEALERS	MODEL AND ENGINE	TIME	OVER-HAULED	PRICE
Bayside Fly. Serv., Route 60, Revere, Mass.	Coupe Cont. 65	120 hr.	Never	$1400
McBoyle Cub Sales, Arpt., Spring Green, Wis.	J3F Frnkln. 65	62 hr.	New	1400
Reliable Fly.Serv.,P.O.Box 1303,Bristol,Conn.	J-4 Cont. 65	140 hr.	30 hr. fact.maj.	1400
Bayside Fly. Serv., Route 60, Revere, Mass.	Coupe Cont. 65	450 hr.	12/15/40	1350
Southern Vt. Fly. Serv., Arpt., Springfield, Vt.	J3L '40 Lyc. 65	162 hr.	New	1350
Tufts-Edgcumbe, Inc., Ravenswood Arpt., Des Plaines, Illinois	J-4 Cont. 65	540 hr.	100 hr.	1300
Leech Aircraft,Inc.,Roosevelt Fld.,Mineola,N.Y.	Coupe Cont. 65	930 hr.	200 hr.	1300
Bennett Air Serv., P.O. Box 247, Hightstown, N. J.	Coupe Cont. Dual	263 hr.	Just Majored	1298
Lambert Aircraft Sales, Box 261, Robertson, Mo.	Coupe J4 Cont. 65	200 hr.		1295
Southern Arwys. of Danville, Box 205, Danville, Va.	J-3 Cont. 65	385 hr.	Never	1275
Linn County Airw., 221 3rd St. N.E., Cedar Rapids, Iowa	J3L Lyc. 65	100 hr.	New	1260
Southern Vt. Fly. Serv.,Arpt.,N. Springfield,Vt.	J3L '40 Lyc. 65	280 hr.	New	1250
Eddie Braden, Easton Arpt., Easton, Pa.	Cruiser Cont. 75	180 hr.	Top	1250
Baker-Eberle Avia. Co., City Arpt., Detroit, Mich.	J-4 " Cont. 65	330 hr.	100 hr.	1250
Desjardin Auto Serv., 24 Fairmount Avenue, Worcester, Mass.	J-3 Lyc. 65	100 hr.	New	1250
Rudy Pekrul, Traverse City Arpt., Michigan.	J-3-L Lyc. 65	150 hr.		1250
Decatur Avia. Co., 776 S. Maffit St., Decatur, Illinois	J3C Cont. A-65	220 hr.		1250
Madison Fly. Serv., R 1, Madison, Ind.	J3L Lyc. 65	205:10	No	1235
B. F. Hines, P.O. Box 535, Hobbs, N. M.	J3L Lyc. 65	254 hr.	None	1200
Eddie Braden, Easton Arpt., Easton, Pa.	J3L Dual Lyc. 65	250 hr.	New	1200
Eddie Braden, Easton Arpt., Easton, Pa.	J3L Dual Lyc. 65	150 hr.	5 hr.	1200
Al. Gillis Fly. Serv., 125-1st Av. N., Great Falls, Mont	J3C 65 h.p.Cont.	500 hr.	None	1200
Desjardin Auto Serv., 24 Fairmount Ave., Worcester, Mass.	J-4 Cont. 65	550 hr.	400 hr.	1200
M. F. Warrington, Cub Air Serv., Selbyville, Del.	J-3 Cont.A-55	40 hr.	No	1200
Galbraith Air Serv., Munic. Arpt., Paducah, Ky.	J3L Lyc. 65	102 hr.	No	1195
Dethloff Fly. Serv., Euclid Ave. Arpt., Willoughby, Ohio	J-3 Frnkln. 60	200 hr.	Top	1195
M. F. Warrington, Cub Air Serv., Selbyville, Del.	Sport Trainer Cont. A-55	40 hr.	No	1175
Des Moines Fly. Serv., Munic. Arpt., Des Moines, Iowa	J3F Frnkln. 65	400 hr.	None	1150
Frank Rensma, Box 441, Youngsville, Pa.	Sport '40 Lyc. 65	100 hr.	None	1150
Maheux's Arpt., Inc., Stevens Mill Rd., Auburn, Maine	J-2 Seaplane Cont. 40	346 hr.	25 hr.	1150
Bowman Fly. Serv., Arpt., Keene, N. H.	J3L Lyc. 50	460 hr.		1150
Va. Cub Dist., Inc., Box 211, Farmv., Va.	Trainer Lyc. 65	250 hr.		1150
Aero Sales Corp., 1008 First Nat'l Bldg., Birmingham, Ala.	J-3F Frnkln. 60	325 hr.	Top-overh'l	1100
L. H. Air Serv., Hatboro Arpt., Hatboro, Pa.	J3C Cont. 65	350 hr.		1100
Aviation Serv., Inc., Box 408, Newport News, Va.	J3L Lyc. 65	528 hr.	None	1100
Madison Fly. Serv., R. No. 1, Madison, Ind.	Coupe Cont. 65	335:25	No	1100
W. T. Anderson, P.O. Box 275, Essex Fells,N.J.	J3L Lyc. 55	200 hr.	Topped	1100
MF. Warrington, Cub Air Serv., Selbyville, Del.	Trainer J-3 Cont. A-55	35 hr.	Checked	1100
MF. Warrington, Cub Air Serv., Selbyville, Del.	Sport Cont. 55	35 hr.	No	1100
Inter-City Fly. Serv, Munic. Arpt., Ft. Wayne, Ind.	J3F Sport Frnkln. 65	345:20		1098
Robert C. Howe, Gardner Arpt., Gardner, Mass.	J-3 Frnkln. 60	165 hr.		1095
Somerset Hills Arpt., Basking Ridge, N. J.	J3L Lyc. 65	225 hr.	No	1090
South. Arwys. of Danville, Box 205, Danville, Va.	J-3 Lyc. 55	570 hr.	Never	1075
J. A. Atherton, Arpt., Rochester, Minn.	Coupe Cont. 65 h.p.	265 hr.	Yes	1050
Des Moines Fly. Serv., Munic. Arpt., Des Moines, Iowa	J3L Lyc. 65	424 hr.	None	1050
Ken's Cub Flyers, Olean Arpt., Olean, N. Y.	J-3 Frnkln. 60 Dual	600 hr.		1050
Wenatchee Air Serv., Rt. 4, Wena., Wash.	J3 Cont. 50	575 hr.	30 hr.	1050
Ben C. Arquitt, Mun. Arpt., Lima, Ohio.	J-3 Frnkln. 60	187 hr.		1025
Midwest Avia. Corp., Norton Fld., Columbus, Ohio.	Coupe Frnkln. 60	600 hr.		1000
Stillwater Fly. Serv.,Box 466, Stillwater, Okla.	J3C Cont. A50-5	1073:	Neweng.	1000
L. L. Rupert, Box 446, Muskogee, Okla.	J3F '40 Frnkln. 50	150 hr.	like new	1000
G. L. Williams, Syracuse Arpt., Syracuse, N.Y.	J-3 Frnkln. 60	730 hr.	Just	1000
Fayette Airways, Inc., Uniontown, Pa.	J-3 Lyc. 65	450 hr.	12/15/40	1000
Paul D. Eyster, TriState Arpt., Angola, Ind.	J3F Frnkln. 60	235 hr.	None	995
Paul D. Eyster, TriState Arpt., Angola, Ind.	J3F Frnkln. 60	240 hr.	None	995
Paul D. Eyster, TriState Arpt., Angola, Ind.	J3F Frnkln. 60	250 hr.	None	995
Midwest Flyers, Lakeside Arpt., St. Louis, Ill.	J3F Frnkln. 60	350 hr.	None	995
Somerset Hills Arpt., Basking Ridge, N. J.	J3F Frnkln. 60	650 hr.	No	990
St. Louis Fly. Serv., Lambert Fld., Robertson, Mo.	J3F Frnkln. 60	175 hr.	Recently	985
Ben C. Arquitt, Mun. Arpt., Lima, Ohio.	J3 Frnkln. 60	296 hr.	252 hr.	985
Galbraith Air Serv., Munic. Arpt., Paducah, Ky.	J3F Frnkln. 50	398 hr.	No	975
G. L. Williams, Syracuse Arpt., Syracuse, N.Y.	J-3 Frnkln. 60	1050 hr.	Recently	975
Jersey Fly. Serv., Oakland, N. J.	J3 Dual Frnkln. 60	330 hr.	40 hr.	975
Ben C. Arquitt, Mun. Arpt., Lima, Ohio.	J3 Frnkln. 60	314 hr.	272 hr.	970
L-H Air Serv., Hatboro Arpt., Hatboro, Pa.	J3L Lyc. 55	900 hr.	900 hr.	950
West Coast Aircr., L.A. Arpt., Inglewood, Cal.	J3C Cont. 50	550 hr.	120 hr.	950
Safair Inc., Roosevelt Fld., Mineola, N. Y.	Trainer Frnkln. 50	750 hr.	20 hr.	$950
W. Va. Air Serv., Box 401, County Arpt., Clarksburg, W. Va.	Trainer Frnkln. 50	170 hr.		950
Utah Pacific Airways,Inc.,Box 1187,Ogden, U.	J3 Lyc. dual 55	1193 hr.	1165 hr.	950
Clinton Arpt., Elliott Fly. Serv., DeWitt, Ia.	J3 Frnkln. 50	550 hr.		950
Ray Wilson, Inc., Park Hill Arpt., Denver, Colo.	J-3 Frnkln. 50	850 hr.	mjr. 750 hrs.	950
McInnis Avia. Serv., Wold Chamberlain Arpt., Minneapolis, Minn.	J-3 Cont. 50	1100 hr.	50 hr.	950
W. C. Gage, Compton Arpt., Compton, Calif.	J3 Frnkln. 50	1556 hr.	1545 hr.	950
W. A. Crews, 1201 W. Ash, Blytheville, Ark.	Late 1939 F-50	700 hr.	660 hr.	925
Tufts-Edgcumbe, Inc., Ravenswood Arpt., Des Plaines, Ill.	J-3 Frnkln. 50	475 hr.	Never	925
W. A. Crews, 1201 W. Ash, Blytheville, Ark.	Late 1939 Lyc. 50	650 hr.	50 hr.	925
Somerset Hills Arpt., Basking Ridge, N. J.	J3L Lyc. 55	850 hr.	750 hr.	925
Av a. Serv., Inc., Box 408, Newport News, Va.	J3L Lyc. 55	550 hr.	None	900
L-H Air. Serv., Hatboro Arpt., Hatboro, Pa.	J3L Lyc. 50	850 hr.	850 hr.	900
Al Gillis Fly. Serv., 125 1st Av., No. Great Falls, Mont	J3C Cont. 50	900 hr.	50 hr.	900
Desjardin Auto Serv., 24 Fairmount Ave., Worcester, Mass.	J-3 Lyc. 55	900 hr.	700 hr.	900
Hawthorne Fly. Serv., Munic. Arpt., Charleston, S. C.	J-3 Frnkln. 50	900 hr.	Top	900
Hawthorne Fly. Serv., Munic. Arpt., Charleston, S. C.	J-3 Frnkln. 50	1025 hr.	Top	900
Seidner Fly. Serv.,S.A.M. Arpt., Youngstown, O.	J-3 Frnkln. 50	278 hr.	New	900
Red Bank Arpt., Inc., Red Bank, N. J.	J3 Cont. 50	975 hr.	85 hr.	900
Pekrul's Fly. Serv., Traverse City Arpt., Mich.	J-3-F Frnkln.	1010 hr.	370 hr.	900
Decatur Avia. Co., 776 S. Maffit St., Decatur, Ill.	J3F Frnkln. 50	1020 hr.		900
Southern Air Serv., Memphis, Tenn.	Lyc. 50	300 hr.	New	900
Bennett Air. Serv., P.O. Box 247, Hightstown, N. J.	J3F Frnkln. 50	248 hr.	20 hr.	895
Gerald W. Richardson, Port Erie Arpt., Erie, Pa.	J3F Frnkln. 60	300 hr.	200 hr.	895
Gerald W. Richardson, Port Erie Arpt., Erie, Pa.	J3F Frnkln. 60	675 hr.	No	895
Somerset Hills Arpt., Basking Ridge, N. J.	J3L Lyc. 50	900 hr.	750 hr.	890
Bennett Air Serv., P.O. Box 247, Hightstown, N. J.	Cub Train. Dual Frnkln.50 J-3 2 Bendix Mags.	371 hr.	½ hr. Since overhl.	875
Southern Airwys. Sales Co., Munic. Arpt. Birmingham, Alabama	J-3 Frnkln. 50	450 hr.	425 hr.	875
Skelly's Fly. Serv., Greenville Arpt., Greenville, Pa.	J-3 Lyc. 50	850 hr.	800 hr.	875
The Hudson Valley Airc., 68 Dolson Ave., Middletown, N. Y.	J3 Trainer '40 Piper Frnkln. 50	400 hr.	9/40	875
Alabama Air Serv., Auburn Arpt., Auburn, Ala.	J3L Lyc. 55	900 hr.	9/40	850
Alabama Air Serv., Auburn Arpt., Auburn, Ala.	J3L Lyc. 55	1100 hr.	9/40	850
Alabama Air Serv., Auburn Arpt., Auburn, Ala.	J3L Lyc. 55	950 hr.	1/41	850
Mayes Field, Huntington, W. Va.	J3F Frnkln. 50	956 hr.	690 hr.	850
Mayes Field, Huntington, W. Va.	J3C Cont. 50	637 hr.	578 hr.	850
Mayes Field, Huntington, W. Va.	J3F Frnkln. 50	1230 hr.	680 hr.	850
Paul D. Eyster, Tri-State Arpt., Angola, Ind.	J3F Frnkln. 50	397 hr.	None	850
Midwest Avia. Corp., Norton Fld., Col., O.	J3F Frnkln. 50	1080 hr.	2/41	850
Louis A. Musgrove, Arpt., Morgantown, W. Va.	J3L Lyc. 50	800 hr.	Just	850
Akron Airw., Inc., Akron Arpt., Akron, Ohio.	J3L Lyc. 50	765 hr.	600 hr.	850
Frank Rensma, Box 441, Youngsville, Pa.	J3F Frnkln. 50	600 hr.	100 hr.	850
Aircr. Assoc., Inc., Munic. Arpt., Long Beach, Cal.	J3F Frnkln. 50	1780 hr.	No time since	850
John P. Hall, West Haven Arpt., West Haven, Conn.	J3C Cont. 50	800 hr.	Recently	850
Akron Airw., Inc., Akron Arpt., Akron, Ohio.	J3L Lyc. 50	910 hr.	Just	850
Dethloff Fly. Serv., Euclid Ave. Arpt., Willoughby, Ohio	J-3 Frnkln. 50	800 hr.	Just. maj.	850
Fayette Arwys., Inc., Uniontown, Penna.	J-3 Frnkln. 55	795 hr.	12/40	850
John Ruzicka, Circus City Arpt., Peru, Ind.	J3 '39 Frnkln. 50	1400 hr.	250 hr.	850
Red Bank Arpt., Inc., Red Bank, N. J.	J3C Cont. 50	1075 hr.	135 hr.	825
Avia. Serv., Inc., Box 408, Newport News, Va.	J3L Lyc. 50	825 hr.	650 hr.	800
Aircr. Assoc., Inc., Munic. Arpt., Long Beach, Cal.	J3F Frnkln. 50	1285 hr.	56 hr.	800
Fayette Arwys., Inc., Uniontown, Penna.	J-3 Lyc. 50	815 hr.	12/40	800
DuBois Avia. Assoc., Airpt., DuBois, Pa.	J3F Frnkln. 50	456 hr.	90 hr.	795
Fayette Arwys., Inc., Uniontown, Penna.	J-3 Lyc. 50	900 hr.	12/40	785
Alabama Air Serv., Auburn Arpt., Auburn, Ala.	J-3 Frnkln. 50	725 hr.	550 hr.	775
Jones Fly. Serv., Sullivant Ave. Airport, Columbus, Ohio.	J-3 Frnkln. 50	1500 hr.	No time sincefact.	775
Jenkins Air Serv., Rochester Munic. Arpt., Rochester, N. Y.	J-3 Lyc. 50	1000 hr.	1000 hr. Top	775
Bob Howe, Gardner Arpt., Gardner, Mass.	Late '39 Cub J3 Cont. 40 hp.	130 hr.		775
Jenkins Air Serv., Inc., Munic. Arpt., Roch., N. Y.	J3 Lyc. 50	1086 hr.	1086 hr.	775
Alabama Air Serv., Auburn Arpt., Auburn, Ala.	J3F Frnkln. 50	1050 hr.	9/15/40	750
Ben C. Arquitt, Munic. Arpt., Lima, Ohio.	Cub J3 '39 Frnkln. 50	678:20	556:15	750
Skelly's Fly. Serv., Greenville Arpt., Greenville, Pa.	J-3 Lyc. 50	1100 hr.	1000hr. maj.	745
Bennett Air Serv., P.O. Box 247, Hightstown, N. J.	Cub Trainer J3 Frnk. 50	703 hr.	Eng. time 48 min.	725
Avia. Serv., Box 408, Newport News, Va.	J3L Lyc. 50	1100 hr.	675 hr.	700
Wallace Aircr. Co., Clarcona, Fla.	J3C Cont. 40	475 hr.	Recently	700
Midwest Avia. Corp., Norton Fld., Col., O.	J3F Frnkln. 50	1068 hr.	2/7/41	700
E. H. Brockenbrough, Munic. Arpt., Charlotte, N. C.	J-2 Cont.	700 hr.	80 hr.	700

FLYING and POPULAR AVIATION USED PLANE LISTING OF

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Johnny Haralson, Air Trans. & Sales Co., Toney Field, Pine Bluff, Ark.	Cub J-3	Cont. A-44	650 hr.	600 hr.	$ 695
Edwards Fly. Serv., Flushing Arpt., Flush., N.Y.	J3C	Cont. 40	1350 hr.	Recon-ditioned	675
Avia. Market, Los Angeles Metro. Arpt., Van Nuys, Calif.	J-2	Cont. 40	810 hr.	Yes	675
Dethloff Fly. Serv., Euclid Ave. Arpt., Willoughby, Ohio	1936	Cont. 40	175 hr.	No	675
Calkins Arcft., 1022 N. Atlantic, Seattle, Wash.		Cont. 40	800 hr.	17 hr.	675
Oakland Arcft., Alameda, Cal.	J-2	Cont. 40	1785 hr.	May '40	665
Otha Eddleman, P.O. Box 116, Crane, Texas	J3C	Cont. 40	3.8 hr.	Once	650
Piedmont Avia., Inc., Munic. Arpt., Winston-Salem, N. C.	J-2	Cont. 40	563 hr.	145 hr. Justrelic.	650
Calkins Arcft., 1022 N. Atlantic, Seattle, Wash.		Cont. 40	1467 hr.	138 hr.	650
Seidner Fly. Serv.,S.A.M. Arpt., Youngstown, O.	J2	Cont. 40	400:30	80 hr.	625
McInnis Avia. Serv., Wold Chamberlain Arpt., Minneapolis, Minn.	J-2	Cont. 40	930 hr.	4 hr.	625
Calkins Arcft., 1022 N. Atlantic, Seattle, Wash.	J-2	Cont. 40	854 hr.	263 hr.	625
Wallace Aircr. Co., Clarcona, Fla.	J2	Cont. 40	400 hr.	Recently	600
J. L. Schroeder, Inc., Rt. 3, Box 117, Houston, Texas	J-3	Cont. 40	900 hr.	No time since	600
Doug. Schall, 33 Clagget Rd., Hyattsville, Md.	J-2	Cont. 40	1030 hr.	50 hr.	600
J. L. Schroeder, Rt. 3, Box 117, Houston, Texas	J-3	Cont. 40	850 hr.	10 hr.	600
Wenatchee Air Serv., R.F.D. No. 4, Wenatchee, Wash.	Cub J2	Cont. A40	975 hr.	20 hr. ago	600
Carolina Aircraft Sales, Munic. Arpt., Charlotte, N. C.	J-2	Cont. 40	900 hr.	850 hr.	600
Blvd. Arpt., Inc., Roosevelt Blvd. & Red Lion Rd., Philadelphia, Pa.	J2	Cont. 40	650 hr.	367 hr.	550
Wallace Aircr. Co., Clarcona, Fla.	J2	Cont. 40	600 hr.	Recently	550
Phillips Fly Serv., Arpt., Mt. Pleasant, Mich.	J-2	Cont. 40	250 hr.		550
New Mex. Fly. Serv., Box 67, Clovis, N. M.	Cub Trainer	Cont. 40	700 hr.	Now	510
John Ruzicka, Circus City Arpt., Peru, Ind.	Cub J-2 '37	Cont. 40	310 hr.	10 hr.	500
PITCAIRN					
Blvd. Arpt., Inc., Roosevelt Blvd. & Rd. Lion Rd. Philadelphia, Pa.	Mailwing PA-7	Wright 240	450 hr.	No	1800
PORTERFIELD					
Al Guthrie, Stillwater Fly. Serv., Box 466, Stillwater, Okla.	LP-65	Lyc. 65	289 hr.	276 hr.	1500
Otha Eddleman, P.O. Box #116, Crane, Tex.	CP-65	Cont. 65	43 hr.	New	1437
Speed's Flyg. Serv., Holmes Arpt., Jackson Heights, N. Y.		Cont. 50	105 hr.		1200
Lambert Aircraft Sales, Box 261, Robertson, Mo.	CP-50	Cont. 50	300 hr.		1195
Moline Fly. Serv., Munic. Arpt., Moline, Ill.	CP50	Cont. 50	350 hr.	250 hr.	1095
Lambert Aircraft Sales, Box 261 Robertson, Mo.	CP-50	Cont. 50	350 hr.		1080
Al Guthrie, Box 466, Stillwater, Okla.	CP-50	Cont. 50	960 hr.	14 hr.	950
Baker-Eberle Avia. Co., City Arpt., Detroit, Mich.		LeBlond 70	485 hr.	90 hr.	850
Clinch Fly. Serv., Munic. Arpt., North Platte, Nebr.	Zephyr '37	Cont. 40	200 hr.	None	550
REARWIN					
Doug Schall, 33 Claggett Rd., Hyattsville, Md.	Cloudster 3 place	Ken-Royce 120	70 hr.		3850
C. Evers, 247 Park Ave., N.Y.C.		Warner 90	138 hr.	None	2250
Paris Fly. Serv., Munic. Arpt., Paris, Texas.	Skyranger 175	Cont. 75	125 hr.		2100
M. H. Wall, P.O. Box 327, Willoughby, O.	Skyranger 175	Cont. 75	35 hr.		1935
Dawson Air Serv., Box 852, Salina, Kans.	Sportster 9000L	LeBlond 90	Plane 675 hr.	Recently	1275
Jennings Bros., No. Grafton, Mass.		LeBlond 70	680 hr.	50 hr.	1075
Four Lakes Avia. Corp., Royal Arpt., Madison, Wis.	7000	LeBlond 70	265 hr.		1050
E. W. Wiggins Airways, Inc., Boston Met. Arpt., Norwood, Mass.	8500	LeBlond 85	802 hr.	111 hr.	975
Southern Arwys. of Danville, Box 205, Danville, Va.	1936	LeBlond 85	368 hr.	Never	975
E. H. Brockenbrough, Munic. Arpt., Charlotte, N. C.	Sportster	LeBlond 70	900 hr.	50 hr.	900
Racine Fly. Serv., Racine Airport, Racine, Wis.	7000	LeBlond 70	536 hr.	510 hr.	850
SECURITY					
Avia. Serv. Co., Inc., P.O. Box 32, Hartford, Conn.	S1A	Kinner 100	1095 hr.	353 hr.	850
SIKORSKY					
E. W. Wiggins Airways, Inc., Providence, R. I.	S-39	Wasp 450	600 hr.	200 hr.	5500
Carl Evers, 247 Park Ave., N. Y., N. Y.	Amphibian 5 pl	Pratt Whitney Wasp Jr. 300 hp.			3800
Muncie Avia. Corp., Muncie Arpt., Muncie, Ind.	S-39	300 h.p. Pratt-Whitney	465 hr.	55 hr.	3750

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
STANDARD					
A. A. Knowles, Rt. 4, Boise, Ida.	New	Wright J 5,220	417 hr.	3-15-40	$1000
Bob Wight, Box 487, Biloxi, Miss.	D-25	J-5-220	1275 hr.	670 hr.	850
STINSON					
Neil R. McCray, Arpt., Jamestown, N. Y.	SR9F	Wasp 440	725 hr.	475 hr.	10500
Hyannis Arpt. Corp., Box 592, Hyannis, Mass.	Reliant	Lyc. 245	388 hr.	Major 2/15/41	6000
Thomas Oakes, 240 Belleville Ave., Bloomfield, N. J.	SR9BD	Lyc. 245	620 hr.	350 hr.	4500
Leech Aircraft, Inc. Roosevelt Field, Mineola, N. Y.	Reliant	Lyc. 245	950 hr.	150 hr.	3500
Piedmont Avia., Inc., Munic. Arpt., Winston-Salem, N. C.	105 '40	Cont. 80	210 hr.	None	2995
P. J. Sones Co., Haines City, Florida	105	Cont. 80	135 hr.	None	2950
Air Serv., Inc., Bellanca Fld., New Castle, Del.	105	Cont. 80	101 hr.	2 hr.	2950
Franklin Rose Aircr., Bay Airdrome, Alameda, Cal.	105	Cont. 80	275 hr.		2950
Pete Grim, R.F.D. #4, Staunton, Virginia	105	Cont. 80	276 hr.	None	2895
Paul E. DePover, Marshall, Minn.	105	Cont. 80	80 hr.	None	2650
Doug Schall, 33 Claggett Rd., Hyattsville, Md.	105	Cont. 80	200 hr.		2550
Jenkins Air Serv., Inc., Munic. Arpt., Rochester, N. Y.	105	Cont. 80	175 hr.	Top 170 hr.	2550
J. A. Atherton, Arpt., Rochester, Minn.	105	Cont. 80	120 hr.	New	2500
Moline Fly. Serv., Munic. Arpt., Moline, Ill.	SR5-A	Lyc. 245	810 hr.	750 hr.	2495
St. Louis Fly. Serv., Lambert Fld., Robertson, Mo.	105	Cont. 80	249 hr.	20 hr.	2475
P. J. Sones Co., Haines City, Florida	105	Cont. 80	240 hr.	233 hr.	2250
Ellis Eugene Eno, Eno Arpt., Fort Dodge, Iowa	SR-6	Lyc. 245	500 hr.	300 hr.	2150
Colo. Avia. Co., 426 U.S. Nat'l B. B., Denver, Colo.	105	Cont. 75	312 hr.	Yes	2100
Leech Arcft., Inc., RooseveltFld., Mineola, N. Y.	105	Cont. 75	445 hr.	50 since top	2100
Ellis Eugene Eno, Eno Arpt., Fort Dodge Iowa	SR-6	Lyc. 245	450 hr.	200 hr.	1975
Franklin Rose Aircr., Bay Airdrome, Alameda, Cal.	SR5C	Lyc. 260	2500 hr.	8 hr.	1800
St. Louis Fly. Serv., Lambert Fld., Robertson, Mo.	5R	Lyc. 215	1175 hr.	Recently	1750
Becher Arcft. Sales Co., Box 988, Pittsburgh, Pa.	SR	Lyc. 215	624 hr.	35 hr.	1500
Moberly Fly. Serv., 605 Concannon St., Moberly, Mo.	1933SR	Lyc. 215	1250 hr.	1200 hr.	1350
Akron Airways, Arpt., Akron, Ohio.	SR	Lyc.	850 hr.	350 hr.	1350
Akron Airways, Arpt., Akron, Ohio.		Lyc. 215	1200 hr.	315 hr.	1300
Lambert Aircraft Sales, Box 261, Robertson, Mo.	105	Cont. 75	350 hr.		1195
R. F. Turner, Airport, Spartanburg, S. C.	S	Lyc. 680	800 hr.	150 hr.	1150
Springfield Avia. Co., Munic. Arpt., Springfield, Illinois	SM8A	Lyc. 215	750 hr.	360 hr.	1050
Louis A. Musgrove, Arpt., Morgantown, W. Va.	SR	Lyc. 215	1000 hr.	400 hr.	1000
Livingston Airways Corp., Chapman Fld., Waterloo, Iowa	SM-8A	Lyc. 215	930 hr.	900 hr.	1000
KnoxFlite, Munic. Arpt., Knoxville, Tenn.	JRS	Lyc. 215	1100 hr.	162 hr.	1000
DuBois Avia. Assoc., Arpt., DuBois, Pa.	S	Lyc. 215	1103 hr.	320 hr.	995
Dubois Avia. Assoc., Munic. Arpt., DuBois, Pa.	S	Lyc. 215	1023 hr.	285 hr.	995
Maheux's Airport, Inc., Stevens Mill Rd., Auburn, Maine	SM8A	Lyc. 215	5441 hr.	226 hr.	950
Decatur Avia. Co., 776 S. Maffit St., Decatur, Ill.	SM1F	Wright J69 330 h.p.	850 hr.	220 hr.	895
St. Louis Fly. Serv., Lambert Fld., Robertson, Mo.	JRS	Lyc. 215	1355 hr.	Recently	875
Flying Dutchman Air Serv., Sometown Arpt., Phila., Pa.	SM-8A	Lyc. 220	1474 hr.	30 hr.	875
Bayside Fly. Serv., Route 60, Revere, Mass.	SM-2AC	Wright 250	1400 hr.	May '41	750
Leeward Avia., New Kensington, Pa.	SM-2	Warner 125	550 hr.	Yes	500
TAYLORCRAFT					
Colo. Avia. Co., 426 U.S. Nat'l B.B., Denver, Colo.	BC-65	Cont. 65	50 hr.	No	2050
Avia. Mkt., L.A. Metro. Arpt., Van Nuys, Calif.	BL-65	Lyc. 65	38 hr.	New	1875
Frantz Fly. Serv., Box 2504, Roanoke, Va.	40	Cont. 65	350 hr.		1800
Wichita Falls Air Transp. Co., Box 84, Munic. Arpt., Wichita Falls, Tex.	BL-65	Lyc. 65	New	New	1750
West Coast Arcrft., L.A. Arpt., Inglewood, Cal.	BC-65	Cont. 65	400 hr.	None	1750
Springfield, Avia. Co., Munic. Arpt., Springfield, Ill.	BC-65	Cont. 65	195 hr.	None	1750
A. J. Moore, 324 State St., Baden, Pa.	B-2	Cont. 65	95 hr.		1750
Franklin Rose Aircrft, Bay Aird, Alameda, Cal.	BC-65	Cont. 65	175 hr.		1750
Dufort School of Aeron., Malone Arpt., Malone, N. Y.	BC-65	Cont. 65	300 hr.	New 5/1/40	1725
Hood Aircraft Sales Co., LaFleur Arpt., Northampton, Mass.	BL-65	Lyc. 65	65 hr.	New	1724
Colo. Avia. Co., 426 U.S. Nat'l B.B., Denver, Colo.	BC-65	Cont. 65	370 hr.	New	1650
R. A. Snover, Palmyra Arpt., Palmyra, N. J.	BL-65	Lyc. 65	90 hr.	Never	1650
Moline Fly. Serv., Munic. Arpt., Moline, Ill.	BC-65	Cont. 65	650 hr.		1650
Rascoe Turner Aeron., Indianapolis, Ind.	DeLuxe BC	Cont. 65	305 hr.	Top reg.	1650
Washington Pk. Arpt., Homewood, Ill.		Cont. 65	150 hr.	None	1650
Clinch Fly. Serv., Munic. Arpt., North Platte, Nebr.	BL-65	Lyc. 65 dual	1150 hr.	800 hr.	1550
Moline Fly. Serv., Munic. Arpt., Moline, Ill.	BL-65	Lyc. 65	505 hr.	None	1550

AUTHORIZED AIRCRAFT DEALERS

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Inter City Fly. Serv., Inc., Munic. Arpt., Ft. Wayne, Ind.	BC-65	Cont. 65	810 hr.	1/4/41	$1545
Roch. Aeron. Corp., Roch. Arpt., Roch., N. Y.	BL-65	Lyc. 65	80 hr.		1525
Bob Howe, Gardner Arpt., Gardner, Mass.	BC1940	Cont. 65 h.p.	168 hr.		1500
Doug Schall, 33 Claggett Rd., Hyattsville, Md.	BL-65	Lyc. 65	80 hr.		1495
Merrill Hale, Hillsgrove, R. I.		Cont. 65	490 hr.		1495
Inter City Fly. Serv., Inc., Munic. Arpt., Ft. Wayne, Ind.	BC-65	Cont. 65	926 hr.	35 hr.	1485
St. Louis Fly. Serv., Lambert Fld., Robertson, Mo.	BL-65	Lyc. 65	180 hr.	Recently	1475
McInnis Avia. Serv., Wold Chamberlain Arpt., Minneapolis, Minn.	BL-65	Lyc. 65	68 hr.	New	1475
Glens Falls Fly. Serv. Arpt., Glens Falls, N. Y.	DeLuxe BC	Cont. 65	475 hr.	450 hr.	1475
Ranger Fly. Serv., Ranger, Texas	BL-65	Lyc. 65	140 hr.	140 hr.	1450
R. A. Snover, Palmyra Arpt., Palmyra, N. J.	BL-65	Lyc. 65	200 hr.	Never	1450
Rochester Aeronautical Corp., Rochester Arpt., Rochester, N. Y.	BL-65	Lyc. 65	470 hr.		1450
Moline Fly. Serv., Munic. Arpt., Moline, Ill.	BL-65	Lyc. 65	165 hr.	None	1450
Tuscarawas County Avia., Inc., Munic. Arpt., New Phila., Ohio	BL-65	Lyc. 65	401 hr.	Never	1400
Duane L. Huscher, Box 65, Lawton, Okla.	BC	Cont. 65	1100 hr.	500 hr.	1400
Ranger Fly. Serv., Munic. Arpt., Ranger, Texas	BL-65	Lyc. 65 dual	170 hr.	170 hr.	1395
Washington Pk. Arpt., Inc., Homewood, Ill.		Lyc. 50	85 hr.	None	1390
Washington Pk. Arpt., Inc., Homewood, Ill.		Lyc. 50	104 hr.	None	1375
Dufort School of Aeron., Malone Arpt., Malone, N. Y.	BL-55	Lyc. 55	100 hr.	New 10/40	1350
Dawson Air Serv., Box 852, Salina, Kans.	BL-65	Lyc. 65	850 hr.	Just	1350
Ranger Fly. Serv., Ranger, Texas	BL-55	Lyc.	180 hr.	180 hr.	1350
Tuscarawas County Avia., Inc., Munic. Arpt., New Philadelphia, Ohio	BL-65	Lyc. 65	614 hr.	Never	1300
Hopewell Fly. Serv., Hopewell Arpt., Hopewell, Va.	BL-65	Lyc. 65	375 hr.	9/40	1300
Washington Pk. Arpt., Inc., Homewood, Ill.		Lyc. 55	235 hr.	None	1295
Marlboro Arpt. Inc., Farm Road, Marlboro, Mass.	BL-65	Lyc. 65	372 hr.	None	1200
Marlboro Arpt., Inc., Farm Road, Marlboro, Mass.	BLT-55	Lyc. 55	472 hr.	None	1200
Clinch Fly. Serv. Munic. Arpt., North Platte, Nebr.	BL-50	Lyc. 50	500 hr.	Just	1200
R. A. Snover Palmyra Arpt., Palmyra, N. J.	BL-50	Lyc. 50	350 hr.	Just	1200
Rochester Aeron. Corp., Rochester Arpt., Rochester, N. Y.	BL-55	Lyc. 55	500 hr.	None	1200
Howard Fly. Serv., Box 565, Ames, Iowa	BL	Lyc. 65	675 hr.	100 hr.	1200
BoydMote, Denman Ave., Coshocton, Ohio	BL-50	Lyc. 50	105 hr.	New 1940	1195
Dufort Sch. of Aeron., Malone Arpt., Malone, N. Y.	BL-55	Lyc. 55	250 hr.	5/1/40	1175
Dawson Air Serv., Box 852, Salina, Kansas	BL-55	Lyc. 55	750 hr.	Just	1150
Bob Howe Gardner Arpt., Gardner, Mass.	BL	Lyc. 50 h.p.	44 hr.		1150
Dewey Eldred Fly. Serv., Lost Nation Arpt., Willoughby, Ohio	BL-65	Lyc. 65	Ship 831 hr.	11/23/40	1100
Phillips Flying Service, Arpt., Mt. Pleasant, Mich.	BL-50	Lyc. 50	800 hr.	650 hr.	1100
Howard Fly. Serv., Box 565, Ames, Iowa	BL	Lyc. 50	800 hr.	Just	1100
Four Lakes Avia. Corp., Royal Arpt., Madison, Wisc.	BL-65	Lyc. 65	469 hr.	358 hr.	1075
Four Lakes Avia. Corp., Royal Arpt., Madison, Wisc.	BL-50	Lyc. 50	506 hr.		1075
Wichita Falls Air Transp. Co., Box 84, Munic. Arpt., Wichita Falls, Texas	BLT-55	Lyc. 55	400 hr.	50 hr.	1050
Phillips Fly. Serv., Arpt., Mt. Pleasant, Mich.	BL-50	Lyc. 50	1100 hr.	900 hr.	1050
Merrill Hale, Hillsgrove, R. I.		Frnkln. 50	268 hr.	35 hr.	1050
Duane L. Huscher, Box 65, Lawton, Okla.	BF	Frnkln. 50	1200 hr.	100 hr.	1025
Spartan School of Aeron., Box 2551, Tulsa, Okla.	BL-50	Lyc. 50	1400 hr.	160 hr.	1000
Rochester, Aeron. Corp., Rochester Arpt., Rochester, N. Y.	BL-65	Lyc. 65	1102 hr.	140 hr.	1000
W. A. Crews, 1201 W. Ash, Blytheville, Ark.	Late '39	Lyc. 65	500 hr.	Major No time	1000
Palmetto Air Sch. Munic. Arpt., Spartanburg, S. C.	BL	Lyc. 50			1000
Palmetto Air Sch., Munic. Arpt., Spartanburg S. C.	BL	Lyc. 65			1000
Ft. Col. Fly. School, Ft. Col., Col., Ohio	BL-50	Lyc. 50	940 hr.	Yes	995
Dewey Eldred Fly. Serv., Lost Nation Arpt., Willoughby, Ohio	BLT-50	Lyc. 50	875 hr.	Recently	975
Four Lakes Avia. Corp., Royal Airport, Madison, Wisc.	BL-50	Lyc. 50	844 hr.	721 hr.	975
John P. Hall, W. Haven Arpt., W. Haven, Conn.	BL-50	Lyc. 50	430 hr.	90 hr.	950
Hood Aircraft Sales Co., LaFleur Arpt., Northampton, Mass.	BL-50	Lyc. 50	875 hr.	10/20/40	950
Hood Aircraft Sales Co., LeFleur Arpt., Northampton, Mass.	BL-50	Lyc. 50	800 hr.	July '40	950
Hobley-Maynard Air Serv., Inc., New Orleans Arpt., New Orleans, La.	BL-50	Lyc. 50	1500 hr.	Recently	900
Louis A. Musgrove, Arpt., Morgantown, W. Va.	BLT-55	Lyc. 55	950 hr.	400 hr.	900
Piedmont Avia., Inc., Munic. Arpt., Winston-Salem, N. C.	BF-50	Frnkln. 50	512 hr.	392 hr.	850
Atlantic Avia. Serv., Dupont Arpt., Wilmington, Del.		Frnkln.	1000 hr.	500 hr.	845
Jennings Bros., No. Grafton, Mass.		Cont. 40	660 hr.	100 hr.	800
Canton Avia. Co., Martin Field, Canton, Ohio	BL-50	Lyc. 50	750 hr.	115 hr.	795
Canton Avia. Co., Martin Field, Canton, Ohio	BL-50	Lyc. 50	725 hr.	125 hr.	795
Canton Avia. Co., Martin Field, Canton, Ohio	BL-50	Lyc. 50	800 hr.	200 hr.	$ 795
Stinson Flyg. Corp., Glendale, Calif.		Cont. 40	1100 hr.	170 hr.	760
Walter D. Mauk, Munic. Arpt., Blackwell, Okla.	A	Cont. 40	550 hr.	490 hr.	750
Kenneth Benesh, Monticello, Ia.	A	Cont. 40	180 hr.	None	745
Rome Boekenhoff, Jr., 2038 Spring St., Quincy, Ill.	A	Cont. 40	576 hr.	2/41	700
Clinch Fly. Serv., Munic. Arpt., No. Platte, Nebr.	A	Cont. 40	850 hr.	700 hr.	700
Duane L. Huscher, Box 65, Lawton, Okla.	A	Cont. A40	1000 hr.	700 hr.	700
B. F. Sponamore, 710 5 St., Dodge City, Kans.	A	Cont. A40-4	600 hr.		700
Carnahan Fly. Serv., Bloomington, Ill.		Cont. 40	507 hr.	100 hr.	700
Merrill Hale, Hillsgrove, R. I.		Cont. 40	1081 hr.	100 hr.	695
Springfield Avia. Co., Munic. Arpt., Sprgfld., Ill.	A	Cont. A-40-4	375 hr.	None	650
J. L. Wells, 106 W. Main, Avon Park, Fla.		Cont. 40	690 hr.	100 hr.	650
Southern Airways, Munic. Arpt., Birmingham, Ala.	A	Cont. 40	375 hr.	350 hr.	550

TRAVELAIR

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Falcon Arcrft. Corp., L.A. Munic. Arpt., Inglewood, Calif.	Osprey	Wright 250	814 hr.	Major 80 hr.	2500
Lyn. Air Trans. & Sales Corp., Preston Glenn Arpt., Lynchburg, Va.	4000	J5 Wright 220	800 hr.	10 hr.	1600
J. S. Barham, Arpt., Santa Rosa, Cal.	12W2002	War-Scarab 125 h.p.	2000 hr.	5-20-40	1450
Sky Harbor, Inc., R. R. No.11, Box 55, Indian., Ind.	Speedwing	Wright J65	800 hr.	July '40	1200
McInnis Avia. Serv., Wold Chamberlain Arpt., Minneapolis, Minn.	4000	Wright J-5 220	1590 hr.	110 hr.	1175
Kenneth Benesh, Monticello, Ia.	4000	Wright J-5 225	1200 hr.	30 hr.	1100
N. Idaho Fly. Serv., Weeks Fld., Coeur D'Alene, Idaho	4000	Wright J5-220	1100 hr.	1050 hr.	1100
J. L. Schroeder, Inc., Rt. 3, Box 117, Houston, Texas	4000	Wright J-5 215	847 hr.	150 hr.	1000
Calif. Arcrft. Corp., P.O. Box 170, Van Nuys, Calif.		Hisso	1500 hr.	Just	850
SkyHarbor,Inc.,R.R.No.11,Box 551,Indian.,Ind.		Tank 115	78 hr.	ship7-40	800
Leeward Avia., New Kensington, Pa.		Chall 185	700 hr.	Yes	745

WACO

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
J. Wayde Stewart, 1319 Avery St., Parkersburg, W. Va.	N	Jacobs 330	100 hr.		5500
Lambert Aircraft Sales, Box 261, Robertson, Mo.	ZDC-7	Jacobs 285	390 hr.	Recently	4975
Foster A. Lane, 2036 James Rd., Columbus, O.	ZKS-7	Jacobs 285	150 hr.		4700
Lyn. Air Transp. & Sales, Preston Glenn Arpt., Lynchburg, Va.	UMF	Cont. 325	335 hr.	140 hr.	4200
Livingston Airways Corp., Chapman Fld., Waterloo, Ia.	S '37	Jacobs 225	185 hr.		4200
Aircraft Sales Corp., 1143 Diversey, Chicago.	YKS-7	Jacobs 225	197 hr.	50 hr.	4000
Hawthorne Fly. Serv., Munic. Arpt.' Charleston, S. C.	ZPF-6 '37	Jacobs 285	760 hr.	Mar. '39	3500
Muncie Avia. Corp., Muncie Arpt., Muncie, Ind.	Custom '36	Wright 285	1150 hr.	No time	3500
Air Serv., Inc., Munic. Arpt., Denver, Colo.	Cust. Cabin	Jacobs 225	990 hr. ship	2/17/41	3400
Aviation Market, L.A. Metro. Arpt., Van Nuys, Calif.	S-7	Jacobs 225	310 hr.	No	3250
Doug Schall, 33 Claggett Rd., Hyattsville, Md.	Cus. Cabin	Jacobs 225	600 hr.	115 hr.	2850
R. Turner Aero Corp., Indianapolis, Ind.		Jacobs 225			2750
E. W. Wiggins Airways, Inc., Boston Met. Arpt. Norwood, Mass.	C	Wright 285	413 hr.	5 hr.	2500
Howard G. Mayes, Huntington, W. Va.	'35 Custom	Jacobs 225	759 hr.	Just	2500
E. W. Wiggins Arwys., Inc., Providence, R. I.	C	Wright 285	350 hr.	Recently	2500
Bowman Fly. Serv., Arpt., Keene, N. H.	NKC-S	Cont. 210	550 hr.	145 hr.	2300
Avia. Serv. Co., Inc., P.O. Box 32, Hartford, Conn.	YOC	Jacobs 225	720 hr.	220 hr.	2250
Neil R. McCray, Airport, Jamestown, N. Y.	'37 C	Jacobs 225	415 hr.	Never	2250
Inter-City Avia., Inc., Boston Mun. Arpt., E. Boston, Mass.	Cabin	Jacobs 225	845 hr.	213 hr.	2175
Doug Schall, 33 Claggett Rd., Hyattsville, Md.	UBF	Cont. 210	800 hr.	Ship & Engine 8	2150
John P. Hall, W. Haven Arpt., W. Haven, Conn.	YMF	Jacobs 225	703 hr.	60 hr.	2050
J. Ruzuika, Circus City Arpt., Peru, Ind.	Cabin	Jacobs 225	700 hr.	110 hr.	2000
J. L. Wells, 106 W. Main, Avon Park, Fla.	YKC	Jacobs 225	650 hr.	200 hr.	2000
Southern Arwys. of Danville, Box 205, Danville, Va.	YKC	Jacobs 225	917 hr.	550 hr.	1850
Arthur J. Davis, E. Lansing, Mich.	CTO	Wright-7	780 hr	Yes	1500
St. Louis Fly. Serv., Lambert Fld., Robertson, Mo.	Cabin	Cont. 165		Recently	1475
Arthur J. Davis, E. Lansing, Mich.	F	Warner 125	124 hr.	Factory	1400
Arents Air Serv., Armonk, N. Y.	OEC	Kinner 210	775 hr.	40 hr.	1275
Tri-City Avia. School, Inc., Tri-Cities Arpt., Endicott, N. Y.	UEC	Cont. 210	210 hr.	187 hr.	1250
W. P. Snyder, 417 W. Mulberry, Kokomo, Ind.	Taperwing	J5-9-220	650 hr.	200 hr	1225
Henry B. Chapman, N.O. Arpt., New Orleans, La.	RNF	Warner 125	720 hr.	6 hr.	1100
Arent Air Serv., Armonk Village, N. Y.	YBC	Kinner 210	825 hr.	750 hr.	1100
W. P. Snyder, Mulberry St., Kokomo, Ind.	Taperwing	Wright		Yes	1100
Red Bank Airport, Inc., Red Bank, N. J.	ENF	4 cyl. Martin	550 hr.	35 hr.	1098
J. F. Barham, Arpt., Santa Rosa, Cal.	RNF	Warner 125	1800 hr.	200 hr.	1095
Southern Air Serv., Memphis, Tenn.		Warner 125	1000 hr.	Recently	1050
Avia. Serv. Co., Inc., P.O. Box 32, Hartford, Conn.	QDC	Cont. 165	1063 hr.	203 hr.	1000
Aero Serv., Inc. McKinley Arpt., Canton, Oho	Str.-Wing	Wright J-5	800 hr.	50 hr.	950
Arthur J. Davis, E. Lansing, Mich.	CTO	Wright J6-9	1200 hr.		900
Racine Fly. Serv., Racine Arpt., Racine, Wisc.	Tpr.wing	Wright 250-J6	528 hr	25 hr.	850

Some Test!

WRIGHT FIELD engineers recently conducted an unusual flight test program on seven Curtiss P-40 fighters. The object was to put each of the ships through a 150-hour flight test at high speed, instead of at the leisurely pace normally used. So the seven new fighters were ordered to Patterson Field, close to Wright, and 28 Air Corps officers were detailed to the test flights. Airplane, engine and propeller manufacturers were asked to send technicians so that any difficulties encountered during the tests could be reported immediately to their respective factories so that planes and equipment on the production lines could be altered accordingly.

Each P-40 was to be flown its 150 hours in as short a time as possible. The schedule set up called for constant flight from 5 a.m. to 8:15 each day for three weeks. Three officers were assigned to each plane. The first man flew his ship from 5 a.m. to 1 p.m. The second pilot took over and flew the ship from 1 to 8:15 p.m. The third man rested that day, giving each officer a day and a half of rest after eight straight hours of flying. Thirty enlisted men were used to perform the necessary service and maintenance work to keep the planes flying. Air Corps officials called the concentrated test program an outstanding success.

Read Cloyd Clevenger's helpful new book—

MODERN FLIGHT

Price $2.95

This big new book explains in simple, interesting style all there is to know about flying from the time you first step into a plane through the advanced acrobatic stages. Brilliant illustrations and step-by-step diagrams, drawn by the famous aviation-illustrator, Clayton Knight, enable the reader to learn to fly quickly and accurately.

This book has been carefully checked by Army, Navy, and Civil Aeronautics authorities as of January, 1941.

Send for free descriptive folder "F"

NOBLE AND NOBLE, *PUBLISHERS*, Inc.

100 Fifth Avenue, N. Y. C.

WARPLANE PHOTOGRAPHS!

Actual photographs of the latest U. S. Army and Navy aircraft now available. Size 2¾x4½". 5c each—6 for 25c.

Vought Sikorsky XF4U-1 — Martin B-26
Consolidated XPB2Y-1 — Bell P-39
Douglas SBD-1 — Consolidated XB-24

FREE. New catalog listing over 1000 other U. S. military, Commercial, World War I and foreign aircraft at 4c each.

AIRCRAFT PHOTO SERVICE

3 Myrtle Court — Dept. P — Bridgeport, Conn.

McBOYLE CUB SALES

Distributors
Southwestern Wisconsin
Flight Training—Sales and Service
Lake Delton—Spring Green
Wisconsin

Classified Advertising

RATE: 8c PER WORD — FIRST 15 WORDS $1.00

AIRPLANES—SALE OR TRADE

AIRPLANES, motors, crackups, located everywhere. OX-5 planes, $100 up. Send 25c for complete catalogue giving owner's price, name and address. Used Aircraft Directory, Athens, Ohio.

AIRPLANES WANTED

WANTED: Licensed Cub, lost over lack of payments. Send details to Ted Evans, 161 Roswell, Buffalo, N. Y.

WANTED: Late model damaged light airplanes and crackups. State lowest price. Box 771, Oakland, Calif.

WANTED: Seaplane, 2 place, side by side, 1939 or 1940. Give lowest price and all other information first letter. Box 114, Bay Village, Ohio.

WANTED: Pitcairn Autogiro for use at 8,000 ft. field; state performance, condition and price. Box 613, Steamboat Springs, Colo.

AIRPLANE ENGINES

WANT: Aeronca Crankshift, etc. Will buy complete or damaged engine. Must be priced low. J. E. Siburt, 81 Linden Ave., Moundsville, W. Va.

WANTED: Cirrus Hi-Drive, Menasco, 95 or 125 H.P., or other in line engine. Complete and in running order. Oliver Topliff, 2018 N. Ninth, Springfield, Illinois.

AVIATION SUPPLIES

GENUINE U. S. Army parachute canopies, 24 foot diameter (less risers) only $7.50 each soiled, slightly soiled $9.95, fine condition $12.95. Nice for curtains, ornamentation, drapes, interior decoration or muffiers. Give authentic air to aviation dens when hung from ceiling. Quantity limited. Act quick! Karl Ort, York, Pa.

BOOKS

AERIAL Cameras: How to make them from ordinary Kodaks, how to take and sell the pictures. Complete 70-page book, only $1. Aircraft Directory, Athens, Ohio.

SIMPLIFIED Flying: Every method for everything from take-offs to stunts and navigation, 52 chapters only $1.00. Aircraft Directory, Athens, Ohio.

SIMPLIFIED Instrument Flying: New illustrated book takes many of the headaches out of blind flying instruction. Complete from A to Z, only $1. Aircraft Directory, Athens, Ohio.

SKYWRITING: How to make and use sky-writing equipment, complete 70-page book, only $1.00. Aircraft Directory, Athens, Ohio.

STUNT: How to do every maneuver from simple wingovers to outside loops. Complete book only $1.00. Aircraft Directory, Athens, Ohio.

500 AVIATION Questions correctly answered. Postpaid $1.00. Agents wanted. Aviation Publishers, 73 South Shirley, Pontiac, Mich.

QUESTIONNAIRE: Over 125 questions on the Civil Air Regulations. Only 25c (coin). Questionnaire, Box 552, Santa Fe, N. Mex.

SEND 50c in coin for airplane blueprints with aviation course book. Arthur Moberg, Johnson, Minn.

DON'T fail your Pilot's Examination—Test yourself. Latest multiple choice examination, 150 questions, answers on Car, Meteorology and Navigation. Written by Government licensed Flight and Ground School Instructor. C.O.D. or prepaid, $1.00. Question-Air System, 208 East 34th, Austin, Texas.

USED Correspondence Courses and Educational Books bought, sold or rented. Catalog Free. Vernon Exchange, Summerville, Ga.

QUALIFY as Airplane & Engine Mechanic. 1941 texts prepare you for A & E rating (license) exam. Covers all phases required mechanical work, diagrams and latest Civil Air Regulations. Author holds A & E Certificate plus Aeronautical Engineering Degree. Aircraft text $1.25, Engine text $1.25, Combination $2.00. Postpaid or C.O.D. Flight Press, Box 224, Champaign, Illinois.

INSTRUCTIONS

LEARN Navigation by actually doing flight problems on chart, studying at home. Also practical groundschool courses: Meteorology, Celestial Navigation, etc. Airport School of Navigation, Orange, N. J.

AIRMINDED Young Men interested in preparing for entering the well-paid field of aviation as apprentices see MUAS ad page 94.

CORRESPONDENCE Courses and educational books, slightly used. Sold. Rented. Exchanged. All subjects. Satisfaction guaranteed. Cash paid for used courses. Complete details and bargain catalog free. Nelson Company, 500 Sherman, Dept. E-237, Chicago.

OPENING, limited number of selected young men with $180.00, work board, balance flying time, radio beam, blind flying, aircraft radio license, commercial license. Noll Flying Service, Bellefonte, Pa.

HOW to Learn Flying without money. Folder dime. Ohmeyer, Box 391-F, Hempstead, N. Y.

LEARN how to solder correctly. Complete instructions 50c. Noel Pion, 1943 Hancock St., Los Angeles, Calif.

INSTRUMENTS

FOR Sale: Reconditioned Directional Gyros, Gryo-Horizons, Turns and Banks, Compasses, Airspeeds, Altimeters, etc. All instruments guaranteed, lowest prices. Write for details. Aircraft Instrument Service, Inc., Detroit City Airport, Detroit, Mich.

MISCELLANEOUS—SALE OR TRADE

GOOD 36 H.P. Aeronca engine, type E113C, C3 tail group, wheels, tires and other parts, priced to sell. Louis Parsons, Uvalde, Texas.

MISCELLANEOUS

PHOTOGRAPHS. "Spitfire," "Defiant," "Roc" and list of European warplanes, 25c. Airpix, 54 Churchill, Toronto, Canada.

GENUINE airline insignia stickers (not imitations) used by major airlines for luggage and cars. Three different 30c. Blackburn Aircraft, Burlington, Wisconsin.

POETS: Aviation poetry wanted. Include agreement to accept ten percent royalty. Jack Cafarelli, Room 417, YMCA, Dayton, Ohio.

AIRLINE Hobby: Collect airline labels from all over the world. Two (different), list 20c. Free label with order. Geddes Aircraft, 18 Austin, New Britain, Conn.

FINANCE your light plane. Easiest terms. Quickest service. New low rates. Ed Hoadley, Bloomington, Ind.

15 AIRPLANES on different airmail stamps. Stampax, P. O. Box 5544, Cleveland, Ohio.

PATENTS

INVENTORS: Unpatented inventions now salable with positive safeguards under patent laws. New, low-cost procedure. Complete details free. American Patents Corporation. Dept. 25, Washington, D. C.

INVENTORS: Have you a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 119, Washington, D. C.

PATENTS: Low cost. Book and advice free. L. F. Randolph, Dept. 372, Washington, D. C.

PATENTS Secured. Two valuable booklets sent free. Write immediately. Victor J. Evans & Company, 429-E Victor Bldg., Washington, D. C.

PROPELLERS

PROPELLERS for aircraft, sleds, boats, dehydrators, etc. Approved wooden propeller repairing. Complete reconditioning of 40 to 75 H.P. Propellers, $11.00; 75 to 100 H.P., $12.50; 100 to 150 H.P., $14.50. Catalog 10c. Banks Propeller Co., Love Field, Dallas, Texas.

HELP WANTED

EXPERIENCED men in clerical, bookkeeping, general office routine; salesmen. Age 46; single; native American. Address Box 746, 319 Colorado Bldg., Washington, D. C.

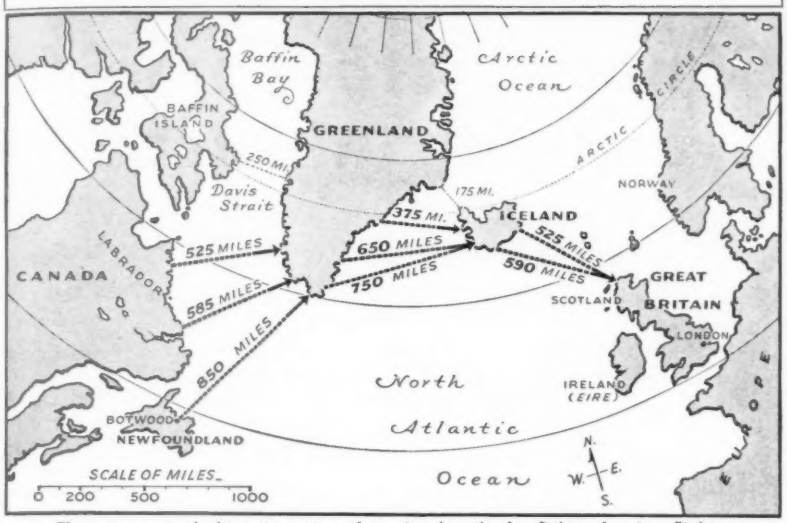
SITUATIONS WANTED

WANTED: Any aviation employment work for board and room. Just want chance. M. Wiebe, 69th and 8th Ave., N.E., Seattle, Wash.

WANTED: Apprentice employment in Aviation. Will accept anything. Selmer Anderson, Larimore, North Dakota.

An Airy Chat with the Editor

(Continued from page 4)



There are several alternate routes of varying lengths for fighter ferrying flights.

THE British need fighting aircraft urgently. They are getting new bombers continually by means of the transatlantic ferrying system. But a solution to the dire need of fighters has yet to be found. Because fighters are so short-ranged they are not flown across, but shipped aboard freighters—to which, of course, German submarines pay special and devastating attention.

However, it is *not* impossible to fly short-ranged fighting planes directly to the British. The accompanying map illustrates a solution. British forces already control Iceland and Greenland. By establishing refuelling bases there, numbers of fighters might logically be flown from Newfoundland (jumping-off point for bombers flying to England) or Labrador to the British Isles via Greenland and Iceland. Notice that all distances on the map are relatively short; most American-built fighters can fly up to 1,000 miles non-stop. With engines throttled back to low cruising speeds, this range can be increased materially. Such flights would, of course, be made largely in good weather. The British could easily set up radio beams in Greenland and Iceland to guide fighters across the stretches of ocean. For engine failures, there could be small fishing boats stationed at intervals along the planes' route. Ferrying pilots could be flown back across the Atlantic in airliners following the same route. In this manner deliveries of fighters could be cut down to a matter of hours, with little German interference.

* * *

WHAT'S-IN-THE-WIND DEPARTMENT. An interesting new twin-engined Grumman fighter, believed to be for the Army, has been test-flying over Long Island recently. . . . One of TWA's Boeing *Stratoliners* spent several days at March Field, the U. S. Army base in California, and in Kansas City, checking out British pilots on the four-engined equipment. . . . A Consolidated *Liberator* (B-24) made the non-stop flight from San Diego to New York in 9 hours, 54 minutes, averaging about 270 m.p.h. We'll bet you didn't take a good look at our front cover this month. Recognize the hefty aerial photographer? He's N. R. Strohmeyer, FLYING AND POPULAR AVIATION'S official photographer for the past several years. He was photographed by Cy La Tour while at work with the Illinois National Guard aviation squadron.

Bell Aircraft already is investigating the private airplane market. . . . There is said to be a rancher in Brazil who owns and operates 27 Stinson "105"s! . . . The Navy is very much interested in CPTP instructors. . . . The North American NA-73, an Allison-powered fighter, is being built for the R.A.F. and is known as the *Mustang* . . . Peyton Autry, technical writer for this magazine, recently joined the Boeing company's engineering department as a draftsman. . . Army Air Corps basic training is expected to be turned over gradually to private operators, in the same manner as has Army primary training. . . . R.A.F. pilots tell us that one type of twin-engined American bomber has to be stalled before it is possible to get its bomb doors closed. . . .

Lockheed spent more than $3,500,000 for special tools and development of its P-38 *(see page 31)*. . . . During December, 1940, Pan American Airways carried 299 passengers on its San Francisco-Hong Kong transpacific route, 60 of which flew free. . . . Delta Air Lines recently sold four Douglas DC-2's, presumably to the British, for a total of $198,000. . . . Vought-Sikorsky has a contract for 1,006 OS2U planes for the Navy. . . . Hamilton-Standard now has a four-bladed hydromatic propeller for 2,500 h.p. engines. . . . Wright Field recently ordered $1,800,000 worth of spark plugs from AC and Champion. . . .

* * *

Now what have *you* heard? MAX KARANT.

END

YOURS...

for only 1/4 DOWN!

A Waterproof Wrist Watch That Actually Winds Itself!

Rabsons offers you the famous CROTON AQUAMATIC on easy terms—only ¼ DOWN PAYMENT—if you order direct by coupon! This 17-jewel chronometer is both waterproof and dustproof—non-magnetic — shockproof — with unbreakable crystal, waterproofed strap and radium dial!

CROTON 17-JEWEL AQUAMATIC

The Aviator's Wrist Watch

FOR ALL OUTDOOR SPORTS

Now you can own this precision watch (regular list price, $37.50) for only $29.95—BUY IT FOR ONLY $7.50 DOWN PAYMENT—and pay the balance in convenient installments Don't delay—

Mail the Coupon Today

Rabsons

SEND NO MONEY!

Rabsons Gift Shop, Dept. 445W
111 West 32nd Street, New York City
Send me the CROTON AQUAMATIC as advertised, at reduced price of $29.95, postpaid. I will pay postman down payment of $7.50 (or en-closed) and will pay balance in 3 equal monthly installments, first installment to be paid 30 days after receipt of watch.

Name.....Age.....
Address.....
Employed by.....How long?.....
Address.....

NEW AERONAUTICAL BOOKS

COMMERCIAL and PRIVATE PILOTS: New "Aeronautical Training" fully covers new multiple choice examinations, with drift, off course and alternate airport problems plotted and solution given. Commercial examinations are shown in separate section of the book. Navigation, Meteorology, Aircraft, Engines and CAR covered. Just published—11th edition only $2.00 postpaid, or C.O.D.

AIRPLANE and ENGINE MECHANICS: Examinations. New authentic Quiz Book in question and answer form. Why fail? Only $3.00 for both examinations, and CAR.

INSTRUMENT FLYING by Lt. Comdr. P. V. H. Weems, U.S.N. ret., and Charles A. Zweng, Instructor, U.S. AIR CORPS. A new and different book known as the "Howard Stark edition" written especially to prepare the pilot for the government examination for "instrument rating." Radio-Telephone Permit included, with Meteorology, Radio-Orientation, let-down, offcourse and alternate airport problems. DeLuxe edition, red leatherette cover with gold letters. Only $4.00 postpaid.

FLIGHT INSTRUCTOR: A new quiz text covering the scope of the written examination for flight instructor rating. Illustrated with pertinent diagrams. $2.00, postpaid, or C.O.D.

GROUND INSTRUCTOR: A new book, prepares for government examinations on Navigation, Meteorology, Aircraft, Engines and CAR. Why fail? Only $3.00 postpaid.

NAVIGATION PLOTTER, (Dept. of Commerce type) is necessary for all problems involving drift, letdown and offcourse, including alternate airport problems. May be used when taking examination. Complete with large leatherette Navigation Note Book and instructions, only $4.00 postpaid.

AIR NAVIGATION (Gold Medal Edition) includes meteorology, $5.00 postpaid.

SIMPLIFIED CELESTIAL NAVIGATION by P. V. H. Weems and E. A. Link, Jr. $3.00 postpaid.

DALTON MARK VII AIRCRAFT COMPUTER: With book of instruction . . . $7.50.

Order From

Pan American Navigation Service

Dept. P, 1435 Flower St., Glendale, Calif.

MOVING May 1st? . . . then drop a postcard to the circulation department giving both your new and old address. We don't want you to miss an issue of FLYING and POPULAR AVIATION.

Standard Manual for Designers:

Engineering Aerodynamics

by Walter S. Diehl

Commander, U. S. Navy; Engineering Division, Bureau of Aeronautics. Member, Aerodynamics Committee, N. A. C. A.

2nd Edition, 556 pages, 266 illustrations, $7.00

ARRANGES for convenient reference and application a great mass of material made available through intensive aerodynamic research by the various laboratories and through experimental construction by airplane manufacturers. Supplies designer and advanced aeronautical student with concise, practical information on the dynamics of airplane design. The book is a carefully planned, original development of practical design methods.

Weather Guide for Air Pilots

by Elbert Lee Eaton, Aerographer, U. S. Marine Corps. *74 pages, 27 illustrations, $2.00*

THIS concise manual provides an explanation of the various weather phenomena that have a direct bearing on flying, boiled down into brief form. Fundamental principles are first presented understandably, then their interpretation is made *for* the pilot in terms of the actual flying conditions they indicate. Particularly important is the book's explanation, with diagrams, of the practical application of the Air Mass theory in weather forecasting.

Aeronautic Radio

by Myron F. Eddy, Lieutenant, U. S. Navy, Retired; Member, Institute of Radio Engineers; formerly instructor in Aircraft Radio at Naval Ground Schools. *502 pages, 198 illustrations, $4.50*

A COMPLETE, up-to-the-minute treatment of current developments both in the use of radio for course guidance and in instrument landings as well as for communication. Offers thorough grounding in principles, selection, installation, operation, and maintenance of radio equipment as used in the air and on the ground. Designed to aid those desiring aviation radio licenses to pass the F.C.C.'s written examination.

Fill in, tear out, and mail

Sent on 5 Days' Approval

The Ronald Press Company,
Dept. M485, 15 East 26th St., New York

Send me the books I have checked below. I will remit at the prices shown, plus a few cents for delivery, within five days after books are received. Or, if any of the books do not come up to my expectations, I have the privilege of returning them within that time. (We pay delivery on orders accompanied by remittance; same approval privilege.)

- ☐ ***Carter,*** **Simple Aerodynamics** $4.50
- ☐ ***Lusk,*** **General Aeronautics** 3.75
- ☐ ***Diehl,*** **Engineering Aerodynamics** ... 7.00
- ☐ ***Eaton,*** **Weather Guide** 2.00
- ☐ ***Eddy,*** **Aeronautic Radio** 4.50

Name .....
Home Address .....
City ..... *State .....
☐ Employed by
☐ or Reference .....
(Must be filled in unless you remit with order)
Address of Above .....
***Outside continental U. S. remit with order at above prices plus 25c per book for shipping.**

5th Revised Edition:

The Famous West Point Textbook

Simple Aerodynamics and the Airplane

by Colonel C. C. Carter

United States Military Academy, West Point, N. Y.

510 Pages, 300 Illustrations, 13 Tables, $4.50

IN THIS EDITION, *Simple Aerodynamics and the Airplane* has been brought completely up-to-date. Here is a clear and easily understood explanation of the fundamental aerodynamics involved in the modern design and operation of the airplane. In scope the book ranges from the explanation of airflow and production of lift to the complete airplane, its stability, maneuverability, and performance.

Originally designed for use at West Point, scores of leading technical schools, colleges, and flying schools are also using it as the foundation textbook in their courses in aeronautical engineering. Through home study, thousands of men unable to enjoy the advantages of school instruction, have been able to obtain from it the basic technical grounding which is essential for substantial progress in this field.

In the preparation of this revision, Colonel Carter received the assistance of the National Advisory Committee for Aeronautics, the Office of the Chief of the Air Corps of the United States Army, and the Material Division of the Air Corps at Wright Field. Suggestions from members of the faculties of many of the schools using Simple Aerodynamics and the Airplane in their aeronautic courses have also greatly aided in its improvement.

The book is profusely illustrated. Over 300 photographs, sketches, graphs, and diagrams are used. Of special interest among these are graphical analyses of loads on an airplane and its component parts in various maneuvers, design curves, illustrations of the latest types of propellers, etc.

Test questions at the end of each chapter—297 in all—drive home important points and guide the reader in checking his understanding of the material presented. An appendix contains 58 basic mathematical equations needed in making aerodynamic calculations. Another appendix contains 129 problems which illustrate how practical design calculations are carried through.

COVERS: Essential Parts of Airplane. The Airfoil. Selections of Airfoils. Parasite Resistance. The Propeller. The Complete Airplane. Stability. Control Surfaces. Performance. Dynamic Loads. Aircraft Instruments.

PREPARES FOR EXAMINATIONS FOR PILOT AND MECHANIC CERTIFICATES

General Aeronautics

A Ground School Textbook

by Hilton F. Lusk

Director, Technical Institute of Aeronautics, Sacramento Junior College; formerly Dean, Boeing School of Aeronautics.

530 Pages, 250 Illustrations, $3.75

THIS book provides an exceptionally complete ground school course in handy book form. It clearly and thoroughly explains all the subjects you need to understand to pass the written part of the Civil Aeronautics Authority's examinations for a certificate as an airplane pilot—in any of the ratings, or for a certificate as an aircraft and aircraft engine mechanic. The 250 illustrations and the simple but accurate explanations make each point so easy to understand that you will have no difficulty in obtaining the required understanding of each subject, even if you are compelled to study at home without the advantage of an instructor's personal guidance. 284 questions like those asked in the official written and practical tests are an important feature; in your preparation to face the C.A.A. examiner you will find these questions immensely helpful.

COVERS: Flight Principles. Airplane Construction and Operation. Aircraft Propellers. Engine Principles. Engine Construction and Operation. Engine and Flight Instruments. Safety Appliances. Avigation—Maps, Piloting, Radio and Instruments. Dead Reckoning. Aeronautical Meteorology. Educational and Training Requirements. Rates of Pay, Employment Opportunities for 100 Aero Industry Occupations.

THE RONALD PRESS COMPANY, Publishers
15 East 26th Street ESTABLISHED 1900 New York, N. Y.

PRINTED IN U. S. A.